

Antibiotics Prescription Pattern in Intensive Care and Medical Emergency Units of a Tertiary Health Care Facility in Zaria, North-West Nigeria

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ABSTRACT

Introduction: Antibiotics continue to be widely prescribed in critically ill patients (CIP), and they form a significant proportion of the total drugs consumed in the intensive care unit (ICU) and medical emergency unit (MEU). However, there is growing evidence that over use of antibiotics in CIP can translate into adverse patient outcomes and increased mortality.

Objective: The aim was to determine the antibiotic prescribing pattern in patients admitted at the ICU and MEU of a tertiary health care facility in northern Nigeria

Methods: A retrospective and descriptive study using structured proforma to obtain information from prescription order forms and treatment sheets of patient admitted to the ICU and MEU between the periods of January to December 2021. Data obtained include patients' demographics and World Health Organization (WHO) drug use (prescribing and facility) indicators. Data were analyzed using descriptive statistics and results presented as frequencies and percentages.

Results: A total of 213 prescriptions were analyzed. All encounters had 1104 drugs with an average of 5 medicines per prescription and 27.7% were antibiotics with 73.8% prescribed by their generic names. All the antibiotics (100%) were prescribed from Essential Medicine List and hospital formulary. Cephalosporins (31%) and nitroimidazoles (23%) ranked highest amongst classes of prescribed antibiotics. Parenteral antibiotic prescriptions were 86% in ICU and 40% in MEU respectively.

Conclusion: We observed a moderate compliance with the WHO standards in antibiotic prescribing pattern in critically ill patients. We recommend that interventions be made and more emphasis placed on the need to promote rational antibiotic prescribing in order to reduce the burden of antibiotic resistance and its negative impact on health and economy of individuals and the society.

Key words: Antibiotics, Prescription Pattern, Drug use indicators, Critically ill patient

INTRODUCTION

Prescription of drugs is often the end result of most clinical consultations, justifying the importance of rational prescription of drugs by the physicians. Rational prescription of drugs involve adherence to proper prescription guidelines. These guidelines include standard drug use indicators as stipulated by the World Health Organization (WHO)¹. Rational prescription of drugs aims to minimize substantially, medication errors. Medication errors which can be conveniently linked to irrational prescription of drugs contribute greatly to drug resistance and ineffective and unsafe therapy. All these culminate into prolongation of hospital stay resulting in both health and financial burden on the patients or increase morbidity and mortality. Thus, it is important to assess the prescribing habits of the physicians in order to make interventions to improve treatment outcomes in patients.

Evaluation of drug prescription pattern is an important aspect of patient care, which also serves as a measure of the quality of care provided. A recent systematic analysis has ascertained that prescribing quality is a dimension requiring constant evaluation². The rational use of drugs is imperative for an effective and efficient health-care system. However, irrational drug use, considered as a global menace is especially prevalent in the developing countries due to irrational prescribing, dispensing, and administration of medications³. Such irrational prescribing is unethical and greatly decreases the standard of drug therapy in addition to resulting in widespread health hazards such as increased incidence of adverse effects, drug interactions, and emergence of drug resistance, especially with antimicrobial therapy⁴.

The WHO defined the inappropriate usage of antibiotics as; any prescribing agents without need or any improper dosage form, or short or long duration of treatment which usually leads to increase in the risk of resistance and also reported that more than half of all medicines are prescribed, dispensed, or sold inappropriately¹.

Prescription pattern monitoring studies are tools for assessing the prescribing, dispensing, and

distribution of medicines prevailing in a particular locality. The main aim of such studies is to facilitate rational use of medicines⁵. The drug use indicators have been developed by the WHO in collaboration with international network for rational use of drugs as an endeavor to measure the extent of rational prescribing⁵. It has been highlighted that the prescription monitoring studies are imperative to bridge the areas such as rational use of drugs, pharmacovigilance, pharmacoeconomics, pharmacogenetics, and evidence-based medicine⁶. In Nigeria, it is currently essential to conduct studies on prescribing patterns and utilize the data generated by such studies to improve the quality of patient care with the primary aim of promoting rational use of drugs.

Antibiotics are important medicines and are commonly used in hospitals. Although antibiotic generally refers to antibacterial, antibiotic compounds are differentiated as antibacteria, antifungals and antivirals to reflect the group of microorganisms they antagonize. Patients that are critically ill usually receive multiple medications from different pharmacological classes. The judicious use of these medications can be lifesaving.

However, the use of multiple medicines may expose a substantial portion of ICUs' patients to drug-related problems such as drug-drug interactions, high risk of adverse effects, and treatment failure⁷. This practice also enhances the development of antimicrobial resistance and increases the side effects of such drugs. In addition, it increases unnecessary treatment costs on the patients⁸. Such increased tendencies of multidrug resistance with limited availability of newer agents to treat emerging cases, emphasize the urgent need for vigilance, surveillance, stringent infection control practices, as well as rational antibiotic prescription. Studies have revealed irrational prescription of antibiotics at the medical outpatient clinic at a tertiary hospital, South-West, Nigeria⁹, and a cross-sectional, retrospective evaluation of antibiotic prescribing in public secondary and tertiary hospitals in Nasarawa State¹⁰. Many of the prescribing

indicators deviated from the WHO ideal values; and thus, were predictors of irrational antibiotic prescribing.

Irrational prescribing is reported to negatively impact on health and economy of individuals and the society, leading to wastage of resources and widespread health hazards. The inappropriate use of antibiotics both in terms of incorrect regimen and non-compliance to set standards of prescription pattern are a major driver of antibiotic resistance. This therefore implies the need to formulate rational antibiotic prescription policy and a strict implementation to prevent extensive use of antibiotics. Interventional programs include infection control with rational antibiotic prescription¹¹, and antibiotic stewardship, with the aim of minimizing unnecessary cost, adverse drug reaction, and emergence of bacterial resistance. Thus, we evaluated the antibiotics prescription patterns in patients admitted at the intensive care and medical emergency units of a tertiary health care facility

METHODS

Study Setting

This study was carried out in the intensive care and medical emergency unit of Ahmadu Bello University Teaching Hospital, Kaduna state, Nigeria.

Study Design

This study was a descriptive, retrospective study that utilized treatment sheets in the folders of patients admitted to the intensive care and medical emergency units of ABUTH between the period of January to December 2021.

Sampling

All eligible prescription order with antibiotics from folders of all the patients admitted to the intensive care unit and medical emergency was considered regardless of age, gender or medical conditions.

Inclusion Criteria

Eligible prescription sheets from patient folder containing: complete patients' demographic data, hospital number, name and signature of the

physician, date of prescription, readable prescription sheets, prescriptions containing at least one antibiotic.

Exclusion Criteria

All prescriptions that did not meet the inclusion criteria were excluded from this study.

Ethical Consideration

Ethical approval was obtained from the Research and Ethics Committee of the hospital before the commencement of data collection.

Data Collection

Data was obtained from prescription order forms (in patient folder) using a structured proforma. Data obtained include: patients demographics and WHO drug use (prescribing and facility) indicators¹. They include: the number of antibiotics prescribed per prescription, classes of prescribed antibiotic, the percentage of antibiotics prescribed by generic name, the percentage of antibiotics prescribed from EDL and the percentage of antibiotics prescribed from the hospital formulary.

Data Analysis

The values of the prescribing indicators were calculated as follows:

1. Average number of drugs prescribed per encounter = $\frac{\text{total number of drugs prescribed}}{\text{total number of encounters surveyed}}$
2. Average number of antibiotics prescribed per encounter = $\frac{\text{total number of antibiotics prescribed}}{\text{total number of encounters surveyed}}$
3. Percentage of antibiotics prescribed by generic name = $\frac{\text{number of essential antibiotics prescribed by generic name}}{\text{total number of essential antibiotics prescribed}} \times 100$
4. Percentage of antibiotics prescribed from EML/hospital formulary 2013 edition = $\frac{\text{number of antibiotics prescribed from EML/hospital formulary 2013 edition}}{\text{total number of antibiotics prescribed}} \times 100$

The data obtained was analyzed using descriptive statistic and percentages and presented in form of tables, bar chart and pie chart.

RESULTS

A total of 213 patient folders containing treatment sheets were successfully analyzed. All encounters had 1104 drugs with an average of 5 medicines per prescription ranging from 1-11 medicines. Of all

the medicines prescribed, 306 were antibiotics and 73.8% of these antibiotics were prescribed by generic name, whereas 100% of the antibiotics were prescribed from Essential Medicine List and hospital formulary (Table 1).

Table 1: Antibiotics Prescribing Indicators

S N	Drug Prescribing Indicators	Values From Study	WHO Standard Values
1	Average number of drugs per prescription	5.2	1.69-1.8
2	Percentage of antibiotics per encounter	27.7%	(20.0-26.8)%
3	Percentage of antibiotics prescribed by generic name	73.8%	100%
4	Percentage of antibiotics prescribed from hospital formulary (2016)	100%	100%
5	Percentage of antibiotics prescribed from EDL	100%	100%

Antibiotics Prescription Patterns: A total (23%), fluoroquinolones (15%), penicillins number of 306 antibiotics were encountered, of (12%), macrolides (10%), lincosamides (4%) and which cephalosporin (31%), nitroimidazole sulphonamides (3%) (Table 2)

Table 2: Antibiotics Prescription Pattern

Antibiotic class	Antibiotic name	N (%)
Penicillins	Amoxicillin + Clavulanate Amoxicillin	35 (12)
Cephalosporins	Ceftriaxone, Cefixime & Cefuroxime	95 (31)
Nitroimidazole	Metronidazole	70 (23)
Macrolides	Erythromycin Azithromycin & Clarithromycin	31 (10)
Lincosamides	Clindamycin	12 (4)
Tetracyclines	Doxycycline	2 (1)
Sulphonamides	Cotrimoxazole	10 (3)
Cabapenems	Meropenem	3 (1)
Flouroquinolones	Ciprofloxacin & Levofloxacin	44 (15)
Chloramphenicols	Chloramphenicol	4 (1.31)

Values are expressed as percentage frequencies, n=306

Antibiotic Prescription Pattern in Medical Emergency Unit

A total number of 209 antibiotics were encountered in the MEU including cephalosporin (29.70%) nitroimidazole (17.70%),

fluoroquinolones (14.35%), penicillins (11.96%), macrolides (14.83%) and lincosamides (5.74%). There were no prescriptions for carbapenems and chloramphenicol respectively (Table 3).

Table 3: Antibiotic Prescription Pattern in Medical Emergency Unit

Antibiotic class	Antibiotic name	n (%)
Penecillins	Amoxicillin + Clavulanate Amoxicillin	25 (11.96)
Cefalosporins	Ceftriaxone Cefixime Cefuroxime	62 (29.70)
Nitroimidazole	Metronidazole	37 (17.70)
Macrolides	Erythromycin Azithromycin Clarithromycin	31 (14.83)
Lincosamides	Clindamycin	12 (5.82)
Tetracyclines	Doxycycline	2 (0.97)
Sulphonamides	Cotrimozole	10 (4.85)
Cabapenems	Meropenem	-
Flouroquinalones	Ciprofloxacin Levofloxacin	30 (14.35)
Chloramphenicols	Chloramphenicol	-

Values are expressed as percentage frequencies, n=209

Antibiotic Prescription Pattern for Intensive Care Unit: A total number of 97 antibiotics were encountered in the ICU, with 34.02% each of cephalosporin and nitroimidazole. 14.43% were fluoroquinolones, and 10.31% prescriptions for

the penicillins. There were no prescriptions for macrolides, lincosamides, carbapenems, tetracyclines and sulphonamides respectively (Table 4).

Table 4: Antibiotic Prescription Pattern for Intensive Care Unit (ICU)

Antibiotic class	Antibiotic name	n (%)
Penecillins	Amoxicillin+Clavulanate Amoxicillin	10 (10.31)
Cefalosporins	Ceftriaxone Cefixime Cefuroxime	33 (34.02)
Nitroimidazole	Metronidazole	33 (34.02)
Macrolides	Erythromycin Azithromycin Clarithromycin	-
Lincosamides	Clindamycin	-
Tetracyclines	Doxycycline	-
Sulphonamides	Cotrimoxazole	-
Carbapenems	Meropenem	3 (3.29)
Flouroquinalones	Ciprofloxacin Levofloxacin	14 (14.43)
Others	Chloramphenicol	4 (4.12)

Values are expressed as Percentage Frequencies, n=97

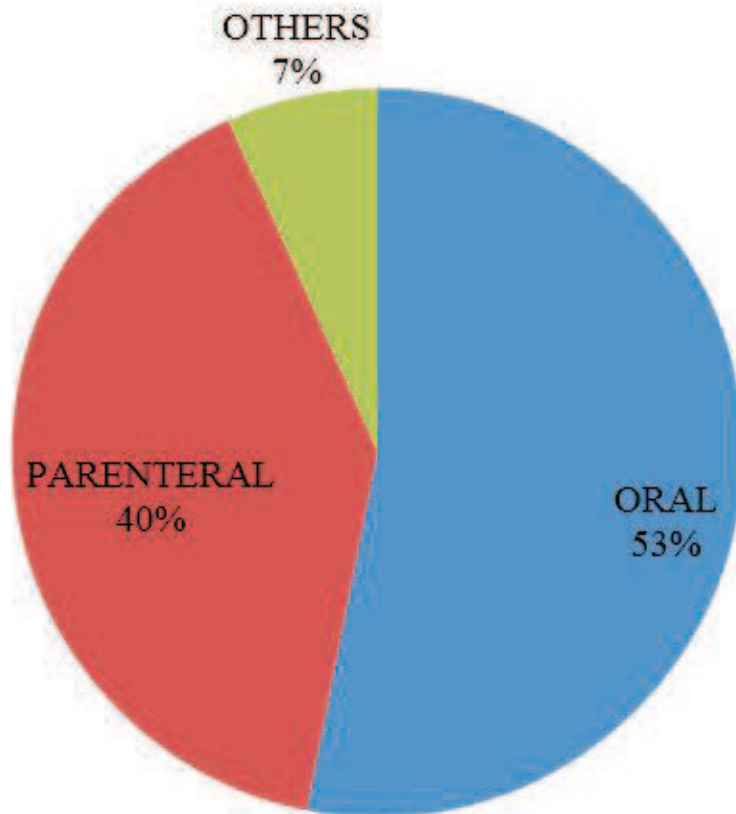


Figure 1: Distribution of Dosage Forms of Antibiotic Prescription in the Medical Emergency Unit

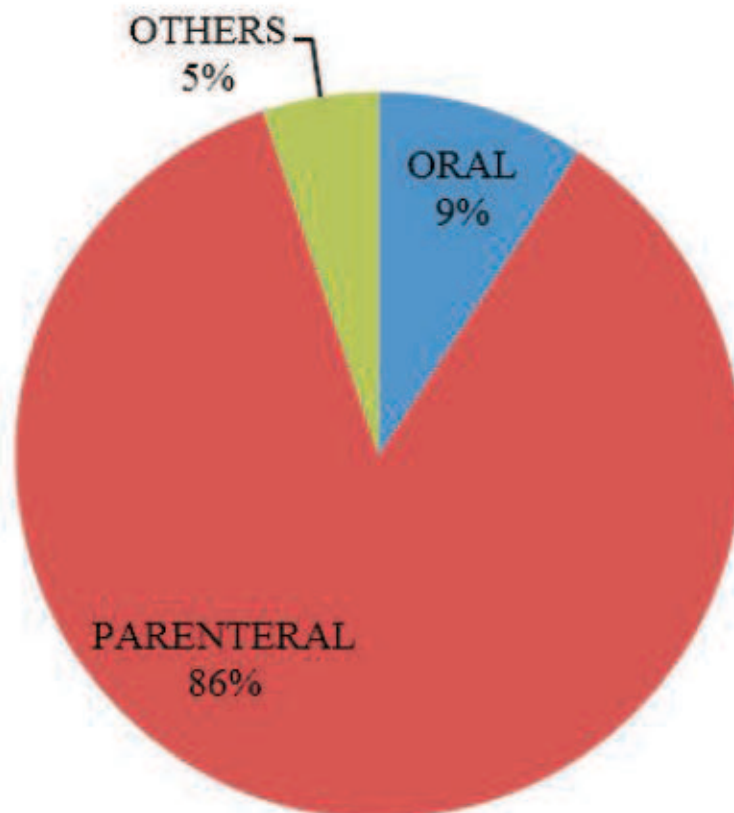


Figure 2: Distribution of Dosage Forms of Antibiotic Prescription in the Intensive Care Unit

DISCUSSION

In the present study, the prescribing pattern of antibiotics at the ICU and MEU has been evaluated using WHO prescribing indicators. We evaluated a total number of 213 patients' prescriptions (from patient folder) in the ICU and MEU, within a period of 4 years. The findings from the study showed that the mean value of prescribed drugs exceeded the WHO recommendation which should be within the range of 1.6-1.8 drugs per prescription¹. This value is similar to studies conducted at South-West, Nigeria⁹, Northern Ethiopia¹² and Madhya Pradesh in India¹³ respectively that documented the average number of drugs prescribed per prescription as also exceeding the WHO. The vast deviation from the WHO standard could be as a result of relatively late presentation to health facilities in these geographical locations, thereby patients may have presented with complicated or exacerbated conditions requiring additional drugs that might not have been necessary had they presented early enough to the facility. More so, this could have resulted from inadequate communication and coordination between health care professionals managing the patients. The lower the number of drugs prescribed per patient, the more appropriate the prescription practice.

Poly pharmacy is associated with drug-drug interactions and adverse drug reactions with a resultant increase in risk of disease complications and poor treatment outcomes. It is recommended by WHO that the number of drugs prescribed per prescription be kept as low as possible to minimize the risk of drug interactions, development of bacterial resistance, and overall increase in hospital costs¹⁴.

We also recorded a deviation in the standard set by WHO of the number of antibiotics prescribed by their generic name, which ought to be 100%¹. According to the WHO indicators, prescribing antibiotics by their generic names is one of the straightforward indicators of using low-cost antibiotics. Our study documented a much higher percentage of generic antibiotic prescription in comparison to similar studies carried out at South-West, Nigeria, were only about half of antibiotic prescription were written in their generic names⁹. The results obtained from our study also further revealed that an average of 1.4 antibiotics were prescribed per prescription accounting for 27.7%. This shows a near conformity with the recommendations by WHO, that prescribes a range from 20-26.8%. This study was carried out in a tertiary health care institution, and majority of patients are known to first present at primary and secondary health care facilities and are referred

mostly as critically ill patients at points that may necessitate the use of more than one antibiotic. Other previous studies^{9,15,16,17}, had recorded a much higher percentage of antibiotics per prescription, however those studies included outpatient prescriptions whereas this current study was carried out in the ICU and MEU alone. It can be inferred thus, that patients requiring special care are mostly subjected to targeted therapy with the most appropriate antibiotic(s) and more often than not empirical therapy is done for outpatients.

The most commonly prescribed antibiotics were the third generation cephalosporins, closely followed by the nitroimidazoles specifically metronidazole with the least prescribed being the carbapenems. The third generation cephalosporins are broad spectrum antibiotics having marked activity against both gram negative/positive organisms and some aerobic organisms. They also have high efficacy against resistant organisms making them suitable for initiation of therapy in patients showing signs of infection with these susceptible organisms, while awaiting MCS results for a targeted management approach. Metronidazole which was also highly prescribed is active against gram negative anaerobes and some organisms implicated in nosocomial infections, justifying its use as almost as frequently as the cephalosporins. Meropenem is however, mostly used as a last resort when other options have been deployed, and in cases of development of resistance because of the relative high cost of the carbapenems.

Results further revealed that injectable antibiotics were most prescribed in the ICU in contrast to oral antibiotics being the most prescribed in the MEU as similarly reported in a study in Addis-Ababa¹⁸. Over prescribing injectable antibiotics is considered a case of inappropriate antibiotic use. Therefore, there is the need to encourage as much as possible for outpatients, more oral antibiotic prescriptions than injectables to reduce injection-site-related infections and decrease health-care costs. Although, our study used patients in the ICU who are critically ill and most times also unconscious and cannot swallow, as such injectable antibiotics were mainly used because of ease of administration and also enables room for dose adjustment.

A striking finding from the study shows that 100% of the antibiotics prescribed were from the hospital formulary and essential drugs list (EDL). This is consistent with a study conducted in Eritrea in which all (100%) of antibiotics were prescribed from the national EDL. The study site is a tertiary health care facility and procure medicines using the essential drug list and hospital formulary in compliance with

the guidelines of the national drug policy. Our study finding showed complete adherence to the standard as endorsed by the WHO.

CONCLUSION

We observed a moderate compliance with the WHO standards in antibiotic prescribing pattern in critically ill patients. We recommend that interventions be made and more emphasis placed on the need to promote rational antibiotic prescribing in order to reduce the burden of antibiotic resistance and its negative impact on health and economy of individuals and the society.

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