



Evaluation of rational prescribing in a hospital paediatric outpatient clinic in Nigeria

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ABSTRACT

Background Irrational prescribing is a continuing public health issue in low/middle-income countries. This study evaluated the drug use pattern of medicines in paediatrics aged below 12 years attending the outpatient paediatric clinic of Bingham University Teaching Hospital, Nigeria.

Method An observational cross-sectional study was conducted using patients' medical records who attended the outpatient paediatric clinic from 1 January to 30 April 2022. The WHO prescribing indicators and guidelines for investigating drug use in health facilities were used.

Result A total of 800 prescriptions containing 2723 drugs were analysed, with a mean number of drugs per prescription of 3.4. A total of 651 patients (81.3%) had at least one antibiotic, and the number of encounters with injection was 17.5% (140 patients). Prescribing by generic name was done for 1406 (51.6%) drugs; of the 2723 drugs prescribed, 2441 (89.6%) were from the WHO Pediatric Essential Medication List. In addition, 80% of the prescriptions contained antimalaria. Analgesics/antipyretics were the most frequently prescribed medicine (87.9%).

Conclusion The findings of this study deviated from the WHO recommended standards. There is a need to target paediatric clinics further and enforce national strategies to tackle non-standard prescribing practices among the paediatric population.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Prescription analysis is an essential tool for evaluating drug use and the rationality of prescriptions. However, irrational drug prescribing practice is a public health issue in low/middle-income countries. In addition, the paediatric population is currently under-represented in previous researches.

WHAT THIS STUDY ADDS

⇒ This study highlights the increasing crisis of irrational drug practice in paediatrics.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Irrational prescribing of drugs can increase the risk of adverse drug effects and drug–drug interaction, and increase healthcare costs. Therefore, guidelines and policies should be formulated on proper and rational drug prescription.



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BACKGROUND

The WHO defines rational use of medicines as 'patients receiving medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time, and at the lowest cost to them and their community.'¹ Drugs are expensive and account for 25% of all healthcare expenditures²; therefore, their rational and efficient use is essential. The World Bank estimates that 20%–50% of healthcare costs in low/middle-income countries are spent on medicines and medical equipment.³

The WHO estimates that about half of the prescribed medicines are used irrationally.^{4–6} Irrational use of medicines is common in low/middle-income countries, causing inefficient and costly services.⁷ The most common practices are polypharmacy, use of wrong or

ineffective medicines, underuse or incorrect use of effective medicines, use of combination products, which are often more expensive and offer no advantage over single-compound products, and overuse of antimicrobials and injections.⁸ Some of the consequences of irrational prescribing include delay in early diagnosis and treatment, increased risk of side effects, drug resistance, reduction in quality of pharmacotherapy, wastage of resources, high treatment cost, reduced patient confidence in the healthcare system, prolonged disease state and even mortality in chronic conditions.^{6 9–11}

As an example of irrational use of medicines as a common practice in low/middle-income countries, in India, the use of antibiotics and the mean number of medicines per prescription were high.¹² In Sudan, the use of generic medicines was low.¹³ Other problems documented in low/middle-income countries were misuse of antibiotics and overuse of injections.^{13–15}

Multiple manufacturers produce generic medicines after the patent of the branded

medicines expires; most of them are less expensive.¹⁶ The cost incurred by a patient is estimated to be 2.6–10 times more for branded drugs than for their generic equivalents.¹⁶ The US Food and Drug Administration states that ‘a generic drug is a medication created to be the same as an already marketed brand-name drug in dosage form, safety, strength, route of administration, quality, performance characteristics, and intended use’.¹⁷ Ufuoma *et al*,¹⁸ Fadare *et al*¹⁹ and Sodipo *et al*²⁰ reported 67.83%, 68.9% and 47.10%, respectively, as the percentage of medications prescribed as generics in different studies conducted in Nigeria. This finding contradicts the National Standard Treatment Guidelines, which stipulate that medicine should be prescribed in their generic form.²¹

Two of the core components of rational prescribing are cost considerations and the safety and effectiveness of different treatment approaches.^{22 23} The use of generic medicines improves consumer access to drugs. It provides significant savings in healthcare costs without affecting the quality or therapeutic outcome of the prescribed medicine.²⁴ Nigeria’s primary health financing mechanism is by the public and private sectors, with only 2% of the population covered by health insurance.²⁵ Currently, Nigeria spends only 3.7% of its gross domestic product on healthcare.²⁶ Direct out-of-pocket payments constitute a significant proportion of overall healthcare expenditures in Nigeria, which places a considerable burden on patients and their families.²⁷

The prescription standard in Nigeria requires the following: a prescription must specify the patient’s full name, address and age, with or without the hospital case number; indicate the date and the name of the drug using the generic name rather than the brand name; specify precisely the strength of tablets, capsules or mixtures; indicate the dose frequency and duration of treatment; no large blank spaces on the prescription; and must be signed by the prescriber, indicating one’s name and if possible one’s address.

The WHO, in collaboration with INRUD (The International Network for Rational Use of Drugs), has developed a set of core indicators for measuring the rational use of medicines in healthcare settings. These indicators will enable comparison between health facilities. The core indicators are: prescribing, patient care and healthcare facility-specific indicators. The prescribing indicators help improve prescribing habits and reduce the cost burden on the patient and healthcare systems. The core prescribing indicators are as follows²⁸:

1. The mean number of drugs per prescription.
2. The percentage of drugs prescribed with generic names.
3. The percentage of encounters with antibiotics prescribed.
4. The percentage of encounters with prescribed injections.
5. The number of drugs prescribed from the Essential Medicines List (EML).

Increasing evidence supports the claims that these prescribing indicators are an essential assessment tool to evaluate the rational use of medications worldwide, especially in low/middle-income countries.²⁹

A proportion of the population of low/middle-income countries comprises children, making it essential to evaluate their health status. In Nigeria, 40% of the population comprises children aged under 14 years,¹⁸ and those below age 12 years constitute the majority of patients who attend paediatric outpatient clinics in Nigeria. The children in this age bracket have a high mortality rate due to their vulnerability to communicable diseases and they require special care and attention. In addition, their underdeveloped immune system and inability to communicate adequately pose a higher risk of adverse drug reactions and higher morbidity and mortality rates.¹⁸ However, although children represent a large proportion of the population in Nigeria and many low/middle-income countries,¹⁵ data on drug use in paediatrics are scarce and under-represented. Studies in Nigeria have shown irrational use of medicines in paediatrics (under 5 years).^{18 19 30} This study was focused on paediatrics aged below 12 years, with most of the patients paying out-of-pocket expenses for healthcare.

Objective

This study aimed to access and address the drug use patterns of healthcare professionals among the paediatric population in a tertiary hospital in Nigeria.

Design

Study design

This study is an observational cross-sectional study that comprised of prescriptions (from 1 January to 30 April 2022) of paediatric patients (aged <12 years) at the outpatient paediatric clinic of Bingham University Teaching Hospital (BHUTH).

Setting

In Nigeria, healthcare is provided by both private and public healthcare facilities. The public healthcare system has three subdivisions: primary, secondary and tertiary. The primary level is the first level of health service contact for individuals, families and communities. It consists of health centres. The secondary level comprises general hospitals and specialist clinics that people go to after referral from primary healthcare centres. Finally, the tertiary level comprises university teaching hospitals and federal medical centres. These facilities have specialists and facilities for advanced medical investigation and treatment.

The study was carried out in the BHUTH, Jos, North Central Nigeria, paediatric outpatient clinic. It has a 250-bed facility and an adequate number of consultants in various fields. The paediatric outpatient clinic is the first point of contact for paediatric patients brought directly from home or referred from another health facility.

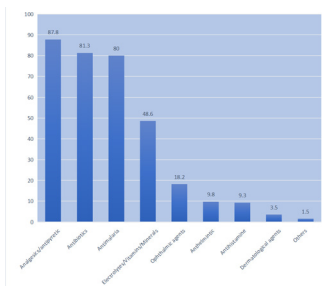


Figure 1 Bar chart showing the percentage per total drug prescribed (total=2723).

Sampling procedure

Using the WHO model of drug utilisation study, a total of 800 patients records were selected for the 4-month period by systematic sampling. The attendance register of the paediatric outpatient clinic was retrieved and the medical records of 200 patients aged below 12 years were selected monthly for the period of the study using a regular interval ratio. The information retrieved from the case notes included biodemographic data; working diagnosis; list of prescribed drugs; the dose, frequency and route of administration; and duration of therapy. All prescriptions were paper prescriptions and were collected from the outpatient paediatric clinic. Any prescription containing one or more medications was considered for collection irrespective of the patients' disease state (acute or chronic). Licensed and practising pharmacists collected data, and illegible prescriptions were not collected.

The WHO prescribing indicators were assessed using the WHO guidelines on investigation of drug use in healthcare facilities. The percentage of encounters with antimalarial medications was also included because the study was conducted in a holo-endemic malarial environment where malaria is responsible for significant morbidity and mortality among children.

Sample size calculation

According to the WHO recommendation, a minimum of 600 prescriptions is required to evaluate the prescribing indicators.³¹ Therefore, we recruited 800 prescriptions from the outpatient paediatric clinic.

Statistical analysis

All collected data were coded, entered and analysed using the SPSS V.22.

Outcome measures

The WHO core prescribing indicators²⁸ were calculated as follows:

1. The mean number of drugs per prescription/encounter was calculated by dividing the total number of different drug products by the number of prescriptions evaluated.
2. The percentage of drugs prescribed using the generic name was determined by dividing the number of drugs prescribed with generic names by the total number of drugs in the prescriptions, multiplied by 100.

3. The percentage of encounters with antibiotics prescribed was calculated by dividing the number of patient encounters during which an antibiotic was prescribed by the total number of patients encountered, multiplied by 100.
4. The percentage of encounters with an injection was determined by dividing the number of encounters during which an injection was prescribed by the total number of patients encountered, multiplied by 100.
5. The percentage of drugs in prescription from the EML was calculated by dividing the number of drugs in the prescription from the EML by the total number of drugs in the prescriptions, multiplied by 100.

RESULT

Data were collected from 800 prescriptions from the outpatient paediatric clinic. Four hundred eighty-four (60.5%) prescriptions were written for males and 316 for females (39.5%). The prescriber's name was written on 703 (87.8%) prescriptions, and all the prescriptions had the prescriber's signature written on them. The mean number of drugs prescribed per prescription was 3.4 (total drugs prescribed: 2723).

Of the 2723 drugs, 1406 (51.6%) were prescribed with generic names (figure 1).

Antibiotics were prescribed for 651 (81.4%) patients (figure 1). Amoxicillin/clavulanic acid was the most frequently prescribed antibiotic and was mainly prescribed using a brand name (eg, Augmentin 457 mg) (figure 2).

Injections were prescribed for 140 (17.5%) patients. Alpha-beta Arteether was the most frequently prescribed injection.

Of the 2723 drugs prescribed, 2441 (89.6%) were from the WHO Pediatric EML (figure 1).

The most frequently prescribed drugs were analgesics/antipyretics, antibiotics and antimalaria (figure 1). Furthermore, paracetamol was the most frequently prescribed analgesic.

Artemisinin-based combination drugs were the most commonly prescribed for antimalaria. Artemether/lumefantrine was the most (23.9%) frequently prescribed antimalaria (figure 3).

The prices of some of the prescribed medicines are shown in table 1. The results for the core prescribing indicators are shown in table 2.

DISCUSSION

This study assessed and analysed the prescription pattern in an outpatient clinic for children below 12 years of age. More than half of the prescriptions analysed contained three or four drugs. This value is higher than the median value reported in the WHO factbook for the African region (2.6) and that for South Asia (2.5), Latin America and the Caribbean (1.8), Middle East and Central Asia (2.6), and East Asia and Pacific (3.0).³²

Fig 2: Bar chart showing the percentage of the types of antibiotics prescribed per total antibiotics

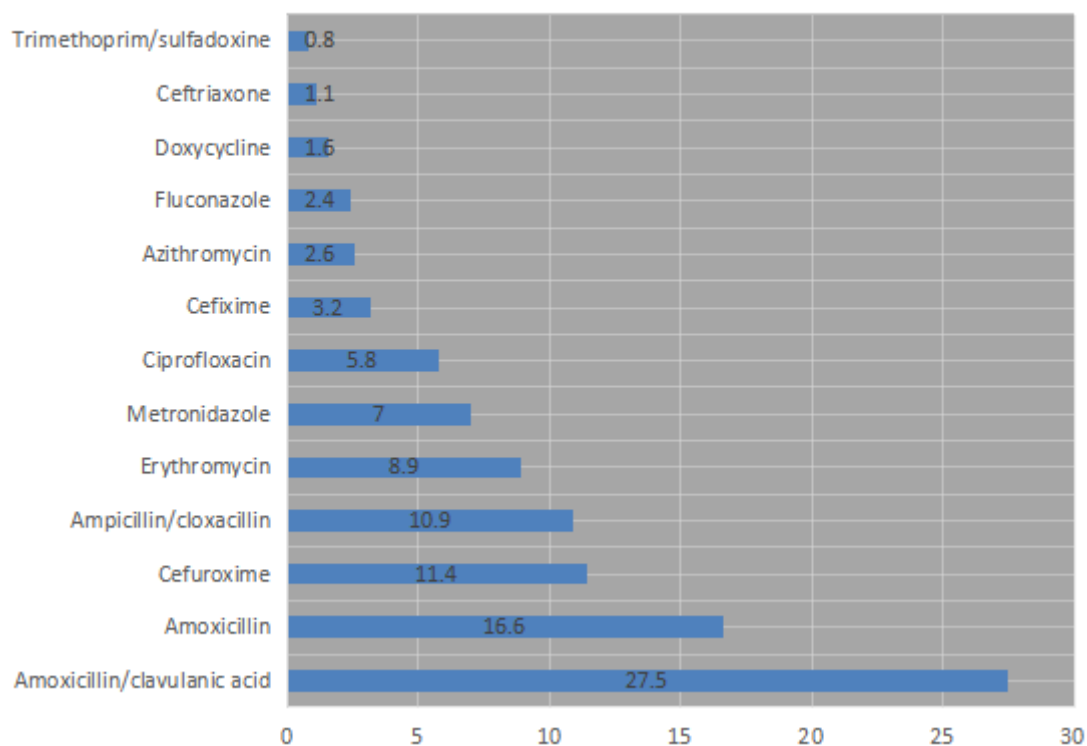


Figure 2 Bar chart showing the percentage of the types of antibiotics prescribed per total antibiotics.

Although the WHO value was obtained from studies in adult patients and a few paediatric patients, it remains the only valid reference. Also, the 3.4 mean number of drugs per prescription is higher than the WHO recommended standard range of 1.6–1.8.³¹ Therefore, the higher number of medicines per prescription obtained in this study compared with the WHO reference value may suggest the increasing rate of polypharmacy in Nigeria and Africa. Polypharmacy increases the risks of adverse effects in children³³ and is common in Nigeria and some low/middle-income countries. Though the problems that polypharmacy poses in adults have been widely recognised, it has increasingly become a concern in paediatrics. Polypharmacy also increases the risk of dispensing errors. Patient compliance is often reduced when more medicines are prescribed, as it may be inconvenient or confusing to the patient.³⁴

Interventions to correct such prescribing habits can potentially lower adverse drug effects, lower the risk of drug–drug interaction, and better tolerability and adherence. In addition, intervention can also lower healthcare costs and provide better patient compliance, leading to successful treatment.^{35 36}

Though generic names were used while prescribing in more than half of the prescriptions analysed, it was still much lower than the WHO standard of 100%. This observation implies that a high percentage of doctors are using the brand name in prescribing drugs in this

facility. It could be due to the influence of prescribing mentors, the influence of pharmaceutical sales representatives, the varying level of training and experience of prescribers, and the availability and adherence to standard treatment guidelines. In a study to identify the factors influencing prescribing habits, Oshikoya *et al* reported that most prescribers indicated the influence of pharmaceutical sales representatives on their prescribing habits and brand names.¹⁴ These pharmaceutical sales representatives are mainly concerned with the sale of their products and sometimes provide financial incentives to prescribers who prescribe their brands. Using the generic name in prescribing is an indicator of rational prescribing. It promotes access and affordability of drugs, thereby encouraging treatment adherence.^{37 38}

In a study conducted by Nwolisa *et al* in Nigeria, they reported that the difference in the cost between the same drugs prescribed in generic names against brand names was between 60% and 41.7%, respectively.³⁰ The cost incurred by a patient is estimated to be 2.6–10 times more for branded drugs than for their generic equivalents.¹⁶ Given that most patients pay for healthcare out of pocket, prescribing branded medicines increases the financial burden on the patient and their family, especially if the patient has a chronic condition. Also, using a generic name facilitates communication between healthcare providers and reduces the risk of confusion and dispensing errors.

Fig. 3: Bar chart showing the percentage of the types of antimalarial per total antimalarial prescribed

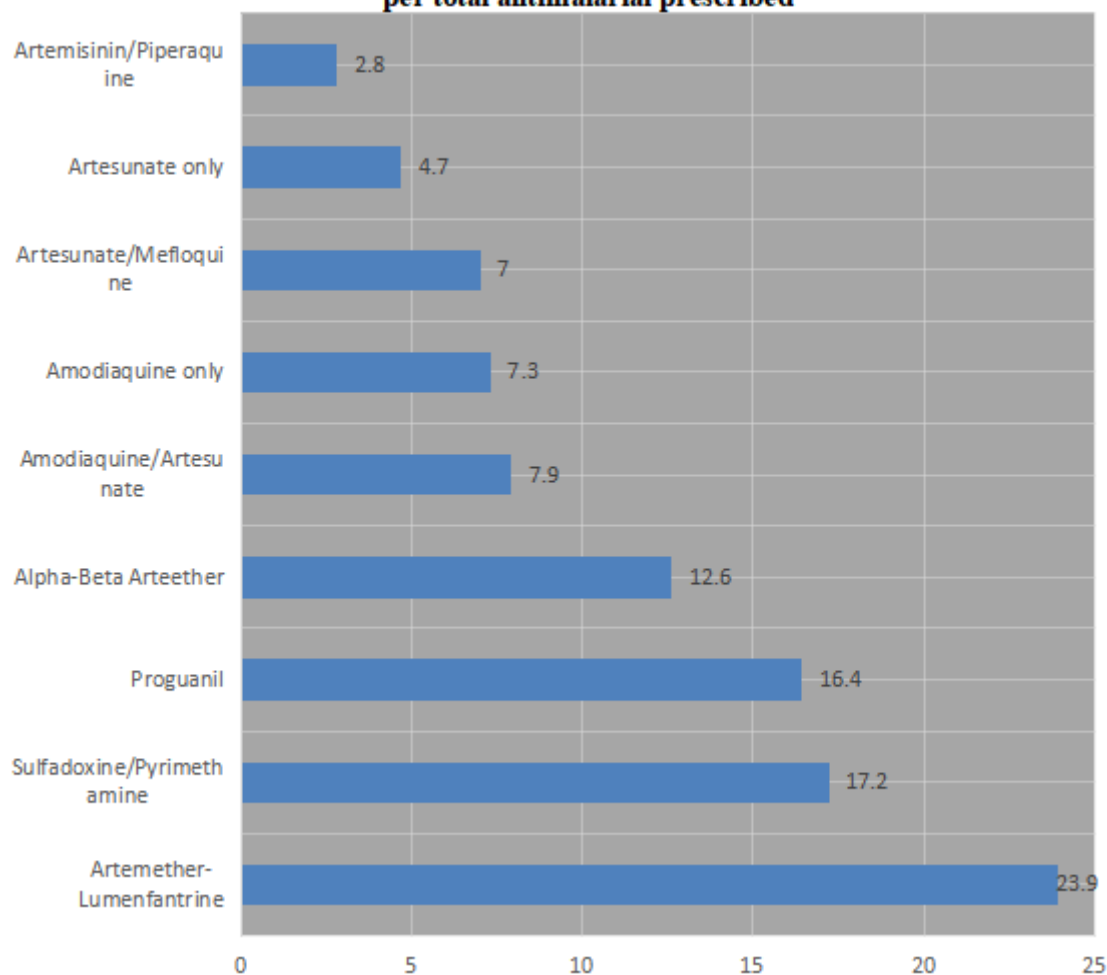


Figure 3 Bar chart showing the percentage of the types of antimalarial per total antimalarials prescribed.

The percentage of prescriptions with antibiotics in this study was 81.4%, which is very high compared with the WHO reference value of <30%.²⁸ The high level of antibiotic use in paediatrics is also seen in low/middle-income countries, as shown at 77.5%, 73.8%, and 58.6%, found in studies in Jordan,¹³ India,¹² and Sudan, respectively.³⁹ Generally, the increasing burden of infectious diseases within the African region could be one of the reasons for the high antibiotic use.⁵ In a study by Talisuna *et al*, over 260 infectious disease epidemics and other potential public health emergencies were reported in the WHO African Region, with cholera being the most geographically widespread.⁴⁰ However, not all antibiotic prescriptions and use may be appropriate. It was observed that antibiotics were prescribed for some patients with malaria, diarrhoea and respiratory tract infections (most were of viral origins). It could be attributed to the empirical use of antibiotics by medical practitioners. Although the empirical use of antibiotics is permitted in some cases, such as apparent pneumonia and cellulitis, it is well known that antibiotic use without a definite diagnosis of infection through laboratory tests can lead to overprescribing.¹⁸ Penicillin

antibiotics (amoxicillin/clavulanic acid and amoxicillin) were the most prescribed in this study, followed by cefuroxime (a cephalosporin antibiotic). The irrational use of antibiotics has contributed significantly to the development of antibiotic resistance. Antibiotics should not be used indiscriminately—a definite diagnosis should be made before antibiotics are used.¹⁸ A more assertive antibiotic policy will also help reduce the irrational prescribing of antibiotics.⁴¹

The percentage of encounters with injection was within the WHO recommended reference value (<20%).³² However, the result obtained (17.5%) was lower than the reported results in the WHO factbook for sub-Saharan Africa (27.5%).³² This optimal value obtained can be attributed to practitioners' better awareness and understanding of injection risk. It may also be as a result of emergency paediatric cases being treated in the emergency paediatric unit, or they are admitted to the paediatric ward for adequate treatment and monitoring.

Although the EML prescribing adherence of 89.6% is comparable with the reported result of 87.8% in the WHO factbook for sub-Saharan Africa, it is still below

Table 1 Prices of some generic and branded products of drugs prescribed

S/N	Drug	Price (naira) generic	Price (naira) branded
1	Syrup amoxicillin/cloxacillin—457 mg	1500	3500
	—228.5 mg	1350	2200
2	Tablet amoxicillin 250 mg (pack of 10 tablets)	450	1500
	Syrup amoxicillin 125 mg/5 mL	500	2300
3	Tablet artemether/lumefantrine 20/120 mg (pack of 6 tablets)	270	1000
4	Tablet sulfadoxine/pyrimethamine 500/25 mg	230	620
	Syrup sulfadoxine/pyrimethamine 500/25 mg	300	800
5	Tablet metronidazole 200 mg (pack of 10 tablets)	300	740
	Syrup metronidazole 100 mg/5 mL	250	1000
6	IM/IV ceftriaxone 1 g	800	3300
7	Syrup fluconazole 10 mg/mL	1200	2700
8	Tablet azithromycin 250 mg (pack of 10 tablets)	1400	5250
	Syrup azithromycin 200 mg/5 mL	1550	3200
9	Tablet cefixime 200 mg (pack of 10 tablets)	1300	2440
10	Syrup cefuroxime 125 mg/5 mL	1800	5200
11	Tablet ampicillin/cloxacillin (pack of 10 tablets)	450	1500
	Syrup ampicillin/cloxacillin 90 mg/0.6 mL	330	1720
12	IM alpha-beta Arteether 75 mg (3 ampoules)	870	1950

IM, intramuscular; IV, intravenous.

the WHO recommended reference value of 100%.³² However, the EML prescribing rate is higher compared with reported values from Latin America and the Caribbean (71.4%), Middle East and Central Asia (79.4%), East Asia and Pacific (71.7%), and South Asia (84%).³² This comparable high value shows that the hospital's stock list is robust enough to handle the needs of the patients. In addition, Ufuoma *et al* reported a high value of 94.03% in a study conducted in Nigeria.¹⁸ This high adherence rate to EML prescribing may be due to the wide adoption of EML in countries and the increasing number of medicines on various EMLs.

The 80% rate of antimalaria prescribing in this study is a result of the high malaria incidence in Nigeria. Similar studies have also reported high antimalaria prescribing in Nigeria and some African countries.^{18–42} Malaria remains a significant public health problem in Nigeria and is responsible for more deaths in any other country.⁴³ The

first-line treatment for uncomplicated malaria in Nigeria is artemisinin-based combination therapy (ACT).⁴⁴ In this study, 23.9% of antimalarials prescribed were artemether/lumefantrine, which correlates with the standard treatment guideline. In a study by Welle *et al*, only 39.6% of healthcare providers preferred ACTs. A lower proportion of health workers had good knowledge of malaria case management.⁴⁴ Also, a study on inpatient awareness of antimalarials by Chukwu *et al* revealed that only about 50% of patients were aware of ACTs.⁴⁵ This finding shows an existing gap in the knowledge and use of ACTs even after 17 years following WHO recommendation of its use in treating uncomplicated malaria. More awareness of the use of ACTs and the government subsidising the price of ACTs will improve the use of ACT to treat uncomplicated malaria.

Table 2 Core prescribing indicators

Prescribing indicators	Total drugs prescribed	Result
The mean number of drugs per prescription	2723	3.4
Percentage of drugs prescribed by generic name	1406	51.60%
Percentage of encounters with an antibiotic(s)	651	81.40%
Percentage of encounters with an injection(s)	140	17.50%
Percentage of drugs prescribed from the Essential Medication List	2441	89.60%

Limitation

This study has some strengths, such as a representative sample size of 800 prescriptions from the outpatient paediatric clinic in a tertiary teaching hospital. Possible prescriber reporting bias was also avoided since the data were via observation of prescriptions with no prescriber interference. Furthermore, this study focused on the understudied age group, among which prescribing patterns and rational prescribing have not been addressed sufficiently. However, this study has some limitations. Conducting this study in a single healthcare facility may limit the conclusion of this study as it may not apply to the general population. Also, seasonal variations and diagnoses of each condition that could affect rational prescribing practices were not considered. In addition, the WHO prescribing indicators also have some limitation as they only indicate the number of medications but do not indicate their adequacy based on the diagnosis. Finally, the number of prescriptions studied varies and may affect study generalisability. The study was done for a period of 4 months only, beginning from January to April, to take into account new measures the hospital makes at the beginning of each year. However, the short period of time may be open to seasonal bias.

CONCLUSION

This study revealed that only an optimal prescribing pattern of drugs from the EML was obtained. The mean number of drugs per prescription, prescribing pattern of antibiotics and injectables, and use of generic names failed to meet WHO standards. The findings of this study reveal the need to target paediatric clinics further and enforce national strategies to tackle non-standard prescribing practices among the paediatric population.

Policy recommendation

- ▶ Establish a drug and therapeutics committee in each hospital, with the specific responsibility of monitoring and ensuring rational use of medicines. The committee should operate independently, and members should represent all the major medical specialties and the administration.
- ▶ Eliminate perverse financial incentives. As earlier stated, some of the prescribers receive incentives from pharmaceutical sales representatives in order to prescribe their brand of medicines.
- ▶ Monitoring, supervision and using group processes to promote rational use of medicines. Some examples of effective form of supervision are prescription audit and feedback, peer review, and group processes of self-identified medicine use problems and solutions in a group of prescribing professionals.
- ▶ Support is also needed from the government. The government should provide sufficient expenditure to ensure availability of medicines and staff.
- ▶ Continuing in-service medical education and targeted educational programmes by professional societies, universities and the government.

Contributors BIO was the guarantor, developed the study concept and design, collected the data, participated in the data analysis, drafted the manuscript and was responsible for the overall content. JCU collected data, analysed the data and reviewed the drafted manuscript for intellectual content. CAN participated in developing the study design, collected data, and reviewed and edited the draft manuscript. EAO analysed and interpreted the data, and reviewed the draft manuscript. JIO collected and analysed the data, and reviewed the draft manuscript. All authors approved the final version of the manuscript.

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Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Ethics approval Ethical approval was obtained from the Institutional Review Board Committee at Bingham University Teaching Hospital, Nigeria.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

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