

## **Evaluation of outpatient paediatric drug prescriptions in a teaching hospital in Nigeria for rational prescribing**

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**Paediatric drug prescriptions are rarely evaluated in Nigeria. This study was therefore aimed at evaluating the paediatric drug prescriptions at the Lagos State University Teaching Hospital (LASUTH), Ikeja so as to determine conformity with rational drug prescriptions. It was also aimed at offering useful interventions to any identified problems.**

**The prescriptions of children aged < 12 years who had attended the paediatric outpatient clinic between January and May 2006 were studied retrospectively. A total of 1944 prescriptions were analysed after excluding those that were illegible. 7146 drugs were prescribed and the numbers of drugs prescribed per patient per visit were between 1 and 8 with a mean value of 3.7. Injections were prescribed for 349 (18.0%) patients and artemether 144 (41.3%) was the most frequently prescribed injection.**

**Only 141 (7.3%) of the drugs were prescribed with pure generic names. Others had their drugs prescribed in**

**proprietary names and abbreviation/ acronym. Antimalarials, analgesics/ antipyretics, vitamin B complex and antibiotics were the most commonly prescribed drugs. All the drugs prescribed, except roxithromycin and the fixed artemesinin based combined drugs, were present in the Nigerian national essential drugs list. Antibiotics constituted 41.4% of the total prescribed drugs.**

**This study has revealed many inappropriate prescriptions in the paediatric outpatient clinic and notable of these are the low rate of prescriptions in generic names; polypharmacy; and over prescription of vitamin B complex and multivitamin supplements. An algorithm for treating common childhood conditions seen at this centre needs to be developed and circulated among doctors attending to these children. Continuous medical education with a focus on rational drug use and evidence based medicine is required.**

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## Introduction

Good prescribing is an art that is not easy to master. Good prescribing, otherwise called rational prescribing, simply means prescribing the appropriate drug, in the correct dosage of an appropriate formulation, at the correct frequency of administration, and for the correct length of time<sup>1,2</sup>. This definition includes not prescribing any drug at all if no prescription is called for. The basis of rational prescribing is a sound knowledge and understanding of the pathophysiology of the diseases to be treated and of the clinical pharmacology of the drugs to be used<sup>1-3</sup> so as to achieve a maximum benefit: risk ratio. Some of the key factors that guide rational prescription are listed below.

- Appropriate indication for the drug based on the diagnosis, e.g. acute bacillary dysentery due to *Shigella* or a viral upper respiratory tract infection, are both self limiting and do not require antibiotics.
- Characteristics of the patient – doses in children should be based on their body weight.
- Characteristics of the disease – dosage regimens are often different for the same drug in different diseases, e.g. the dose is reduced in renal failure if the drug is excreted renally.
- Evidence-based medicine – clinical decisions should be based on the best scientific evidence available at the time of seeing a patient.
- Choice of drug – making a rational choice (based on pharmacokinetics; pharmacodynamics; therapeutic considerations – co-existing diseases, drug toxicity, drug interactions; patient compliance and cost).
- Appropriate route of administration.
- Appropriate formulation – in relation to the child's age.
- Appropriate dosage regimen.
- Duration of treatment – minimum duration required to treat condition.

While appropriate drug therapy can be of great benefit, inappropriate drug therapy is often harmful. Drugs are often prescribed because both doctors and patients view prescriptions as the essential outcome of the visit<sup>3,4</sup>. This is undesirable. Irrational drug prescribing has been identified as one of the risk factors for developing an adverse reaction (ADR)<sup>5,6</sup>. Similarly, irrational drug use can result in ineffective treatments which in turn may cause discomfort to the patient, non-compliance and exacerbation or prolongation of an illness<sup>7</sup>.

Rational drug prescribing should maximise effectiveness, minimise risks, respect patient choice, and minimise costs. Therefore the following logical sequence of events should usually precede writing a prescription:

- making a diagnosis or differential diagnoses
- determining the prognosis of the condition to be treated
- determining the goal(s) of treatment (such as curative, symptom relieving, preventive or, occasionally, an aid to the diagnostic process)
- selecting an appropriate type of treatment<sup>1</sup>.

A guideline for writing a good prescription involves specifying the patient's full name, address, age, with or without hospital case number; indicating clearly the date and the name of the drug using the approved or generic name rather than the proprietary or brand name; specifying precisely the strength of tablets, capsules or mixtures; indicating the dose frequency and total quantity to be supplied or the duration of treatment; not leaving large blank spaces on the prescription; and signing the prescription and indicating one's name, and if possible one's address<sup>1,3</sup>. This format is acceptable throughout Nigeria and is adopted on the prescription forms of all public and teaching hospitals in Lagos, Nigeria.

A guide to rational prescribing in Nigeria has led to the development of the National Essential Drug Lists which also serves as the Nigerian National Formulary. This handbook is modified from the World Health Organization (WHO) essential drug lists to suit the Nigerian environment. It contains a summary of the basic pharmacological information about drugs and their dosages in children and adults. Deviation from the above guideline and non-adherence to the essential drug lists and the national formulary is not routinely recommended. The aim of this study was to evaluate prescriptions for children in Lagos State University Teaching Hospital (LASUTH) in relation to the general format, choice of drugs and the quality of the drug prescription.

## Methods

The prescriptions for children aged < 12 years, written by the doctors in the general outpatient clinics between January and May 2006, were collected from both the fee and non-fee paying pharmacies of the LASUTH, Ikeja and were studied retrospectively.

LASUTH is a tertiary healthcare centre that operates two pharmacies; the non-fee and the fee paying pharmacies. While the former dispenses

drugs at no cost to paediatric and geriatric patients, the latter sells drugs that are not available free of charge at reasonable prices. This reduces the tendency to buy adulterated and fake forms of such drugs from outside pharmacies. Only the general outpatient prescriptions were selected and used for the study. For the purpose of this study, prescriptions were considered illegible if they could not be clearly read by all the researchers and these were mainly carbon-paper duplicates of the original prescriptions.

There is a general outpatient clinic each day, except for weekends and public holidays. It is run by a chief medical officer with 12 years paediatric experience, 2–3 medical officers (from both paediatric and family medicine departments and with a minimum of two years experience) and a second year resident in paediatrics. Most of the children attending the clinic were self-presenting; the rest were referred from the private hospitals/clinics and primary healthcare centres within and outside the state.

Two hundred prescriptions were selected randomly from a box containing the monthly prescriptions from each of the non-fee and fee paying pharmacies. A total of 2,000 prescriptions were therefore selected for the study. Information extracted from the prescription papers included age, sex and the drug prescription. For each prescribed drug, we checked if it was prescribed by generic name, trade/proprietary name or acronym/abbreviation. The formulations prescribed were also noted. Other information extracted included whether the drug was banned, potential interactions of the drug with other drugs and/or food, and the identity of the prescribers (name and signature). A banned drug in the context of this study means a drug that was previously licensed, but due to its severe and frequently reported toxicity, its license was withdrawn and it was considered contraindicated in all children. The data were analysed with SPSS version 13.

## Results

A total of 14,809 children presented to the general paediatric outpatient clinic over the 5 month period. 8338 (56.3%) were males and 6471 (43.7%) were females. The mean age of the children was 4.6 years. Almost half the children (47.6%) were between the ages of one and 6 years.

There were 10,551 prescriptions written over the 5 month period. The number of prescriptions each month remained relatively constant (range 2007–2192). Approximately one quarter of the prescriptions (2701, 25.6%) were from the

fee paying pharmacy and this figure remained relatively constant over the 5 month period. A total of 1944 prescriptions met the criteria for inclusion in the study. The 56 illegible prescriptions were excluded from the study. 836 (43.0%) prescriptions were written for males, 609 (31.3%) for females and 499 (25.7%) did not have their sexes indicated.

All the prescriptions had the names of the patients written on them. 86 (4.4%) had their ages not stated and 48 (2.5%) did not carry the case file number of the patients. The prescribers' names were indicated in 1188 (61.1%) prescriptions, dates were indicated in 1916 (98.6%) and signatures in 1908 (98.2%). The number of drugs prescribed per patient per visit was between 1 and 8 with a mean value of 3.7 (7146 drugs prescribed in total). While four drugs per prescription were the commonest, one drug per prescription was the least.

Injections were prescribed for 349 (18.0%) patients. Artemether 144 (41.3%) was the most frequently prescribed injection. Chloroquine injection was always prescribed with promethazine injection and constituted 15.2% of the prescribed injections. Dipyrone was the only banned drug prescribed and constituted 3.4% of the injections. Gentamicin was the only antibiotic prescribed as an injection and constituted 0.9% of the injections.

717 (36.9%) prescriptions were written with generic and proprietary names; 585 (30.0%) with proprietary names and abbreviation/acronym; 384 (17.8%) with generic, proprietary names and abbreviation/acronym; generic names only 141 (7.3%); and proprietary names only 117 (6.0%).

Antimalarials, analgesics/antipyretics, vitamin B complex and antibiotics were the most frequently prescribed drugs (Table 1). Almost 90% of the

**Table 1** Drugs prescribed

	Number of patients (n=1944)	Percentage of total (%)
Antimalarials	1748	89.9
Analgesics/antipyretics	1290	66.4
Vitamin B complex	1196	61.5
Antibiotics	804	41.4
Folic acid	574	29.5
Antihistamines	441	22.7
Ascorbic acid	356	18.3
Multivitamins	225	11.6
Iron supplement	152	7.8
Antihelminthics	128	6.6
Phenobarbitone	93	4.8
Antiseptic lotions	36	1.9
Antitetanus serum	24	1.2
Eye ointments	23	1.2
Eye drops	12	0.6
Calamine lotion	12	0.6
Tetanus toxoid	11	0.6
Bicarbonate soda	11	0.6
Topical skin lotion	10	0.6

**Table 2** Antimalarial drugs prescribed

	Number of patients (n=1748)	Percentage of total (%)
Proguanil	440	25.2
Artemesinin and amodiaquine	347	19.9
Artemesinin and sulphadoxime/pyrimethamine	344	19.7
Amodiaquine and sulphadoxime/pyrimethamine	260	14.9
Sulphadoxime and pyrimethamine	92	5.3
Amodiaquine only	84	4.8
Artemether and Lumefantrine	68	3.9
Chloroquine only	65	3.7
Artesunate only	48	2.8

drug prescriptions contained an antimalarial drug. Two thirds of the drug prescriptions contained the presence of an analgesic or antipyretic and over half of the drug prescriptions included the presence of a vitamin B complex drug. Artemesinin based combination drugs were the most frequently prescribed antimalarials (Table 2). Of the antimalarials, 1176 (67.3%) were prescribed with their proprietary names and 1203 (68.8%) were prescribed for children < 5 years old. Paracetamol 1152 (94.6%) was the most frequently prescribed analgesic/antipyretic and in 95.0% of cases was prescribed by abbreviation/acronym. Ibuprofen 53 (12.0%) and dipyron 12 (0.9%) were the other prescribed analgesics/antipyretics. All the vitamin B complex prescriptions were written as abbreviations/acronyms.

Antibiotics were prescribed for 804 children (Table 3). Roxithromycin 279 (34.7%) was the most frequently prescribed antibiotic and was prescribed by the proprietary name. Antibiotics were mostly prescribed for children between 1 and 6 years old. 564 (70.2%) of the antibiotic prescriptions were written in their proprietary names. All the prescribed drugs were in the Nigerian National Essential Drugs List, except for roxithromycin and artemesinin combination drugs. The latter were, however, present in the Nigerian national guidelines for malaria treatment.

Drug-drug interactions were found in 0.4% of the prescriptions and involved mostly co-trimoxazole and sulphadoxime/pyrimethamine. Drug-food interaction was observed in all the prescriptions of antihelminthics. No instruction was given on taking these drugs with meals.

**Table 3** Antibiotics prescribed

	Number of patients (n=804)	Percentage of total (%)
Roxithromycin	279	34.7
Amoxicillin	216	26.9
Erythromycin	127	15.8
Co-trimoxazole	89	11.1
Amoxicillin/clavulanic acid	25	3.1
Cefuroxime	25	3.1
Metronidazole	20	3.1
Ampicillin	12	1.5
Nitrofurantoin	8	1.0
Gentamicin	3	0.4

## Discussion

An average drug prescription rate per patient of 3.7 obtained from this study was similar to that previously reported (3.0–4.5) in other studies from Nigeria<sup>8–11</sup> (Table 4). Developing countries with programmes promoting rational drug use as well as standards proposed for the locality have described lower (2.3–2.9) drug prescription rates<sup>12–15</sup> (Table 5). Polypharmacy has been reported as one of the causes of ADRs in children<sup>16</sup>. Polypharmacy, unfortunately, is very common in Nigeria<sup>5,8–11,17,18</sup> and some other developing countries<sup>13</sup>. Our finding of polypharmacy in this study showed that previous studies have not positively influenced the diagnostic skills and the prescribing habits of Nigerian doctors.

Caregivers' expectations have been known to influence the number of complaints of their children. The influence of this and the lucrative promotional programmes of the drug companies on the prescribing practice of the physician have been documented<sup>19–21</sup> and this might have contributed to the observed polypharmacy in this study. Multiple drug prescriptions may cause early depletion of the stocked drugs, thus resulting in further economic burden on the state government to refill the stock. Using many drugs at once could be problematic and tends to be confusing in a patient taking more than three drugs<sup>22</sup>.

A low percentage of injection utilisation from this study contrasts with the results obtained from recent similar studies in Nigeria<sup>5,8,9</sup>. This result is highly commendable and may be attributed to the better knowledge of the doctors about the risks of injections in comparison with the community health workers in the primary health care centres

**Table 4** Core prescribing indicator values for different levels of health care facilities in Nigeria

Parameters	Primary health care centres <sup>5</sup>	Private hospitals <sup>8</sup>	Tertiary hospitals <sup>11</sup>	LASUTH Ikeja
Average number of drugs prescribed per prescription	4.5	4.4	3.0	3.7
Drugs prescribed by generic name (%)	34.2	58.9	13.3	7.3
Antibiotics prescribed (%)	45.0	50.4	17.6	41.4
Injections prescribed (%)	42.9	57.4	1.9	18.0
Drugs prescribed from essential list (%)	67.1	90.9	97.1	84.8

**Table 5** Comparison of drug utilisation in Nigeria with those of other developing countries using WHO core prescribing indicators

Parameters	Primary health care centres in Tanzania <sup>12</sup>	Private hospitals in Uzbekistan <sup>13</sup>	Primary health care centres in Jordan <sup>14</sup>	LASUTH Nigeria
Average number of drugs prescribed per prescription	2.9	2.9	2.3	3.7
Drugs prescribed by generic name (%)	–	38.3	5.1	7.3
Antibiotics prescribed (%)	71.0	56.5	60.9	41.4
Injections prescribed (%)	38.0	57.0	1.2	18.0
Drugs prescribed from essential list (%)	94.0	79.4	93.0	84.8

where many of the previous studies reported were conducted. The most commonly prescribed anti-malarial injection was artemether which showed a good compliance to the WHO recommendations and the national guidelines for malaria treatment. The few cases of chloroquine prescriptions may be related to the high prevalence of chloroquine resistant malaria in Nigeria. Dipyrrone was the only injectable analgesic/antipyretic prescribed. The low percentage prescribed probably resulted from its ban. Dipyrrone had previously been grossly over-prescribed without any consideration for its toxicity<sup>5,9</sup>.

The rate of drug prescription by generic names only in this study was unfortunately low (7.3%). This is similar to other studies<sup>11,13,23,24</sup>. One study in Nigeria previously however reported a rate of 34.2% which shows what can be achieved<sup>5</sup>. Prescribing by generic name allows flexibility of stocking and dispensing various brands of a particular drug that are cheaper and as effective as proprietary brands. This is the basis of essential drugs list use. The high prescription by the proprietary names may have resulted from the good relationships existing between the physicians and the pharmaceutical sales representatives that market the drugs to the hospital.

The high frequency of prescribing antimalarials, analgesics/antipyretics, vitamin B complex and antibiotics observed in our study is similar to previous studies in Nigeria<sup>5,8,9,11</sup>. The high antimalarial prescriptions reflect the high rate of malaria infection in Lagos and this can be explained by the fact that children are more affected by malaria than adults and Lagos being holoendemic for malaria. However, the over-prescription of artemisinin based drugs for empirical treatment of acute uncomplicated malaria is of great concern, as is their prescription by their proprietary names. This indiscriminate use of artemisinin based antimalarials totally deviates from the Nigerian national guidelines for malaria treatment<sup>25</sup>. These drugs were to be used in confirmed cases of malaria so as to avoid early development of resistance to them by the malaria parasites. The majority of the prescribed antimalarials were for children

< 5 years who have been reported to have a high mortality rate from malaria<sup>26</sup>.

Malaria characteristically presents with fever which together with other symptoms form the basis of diagnosis and empirical treatment without recourse to diagnostic investigations<sup>24,27</sup>. This may therefore explain the high rate of paracetamol prescription along with the antimalarials as is commonly seen in Nigeria<sup>11</sup>.

The prescription of vitamin B complex or multi-vitamin supplement along with the antimalarials revealed by this study appears to be a routine practice in Nigeria<sup>8,9,11</sup>. The justification for this practice is not clear to us. However, some parents and doctors believe that both the vitamin B complex and multivitamin supplement may induce or enhance the child's appetite.

Antibiotics are one of the group of drugs involved in ADRs in children<sup>28</sup> and are greatly misused and over-prescribed in Nigeria<sup>5,8,9,11</sup>. Roxithromycin was the most frequently prescribed antibiotic and is not listed in the Nigerian National Essential Drug List<sup>29</sup>. The indications for the prescription of roxithromycin and other antibiotics in this study are not known, but it has been reported in Nigeria that malaria, upper respiratory tract infection and diarrhoea constituted the most common health conditions for which antibiotics are usually prescribed<sup>5,9,30</sup>. Roxithromycin is not contained in the essential drug lists and its prescription is likely to be due to the product promotion and possible gifts to the prescribers from the pharmaceutical company producing and marketing this drug. Such influence on the prescribers has previously been reported in Nigeria<sup>8</sup>.

Even though the percentage of co-trimoxazole and sulphadoxine/pyrimethamine jointly prescribed was very small, the additive effects of their sulpha groups producing severe ADRs, such as Stevens-Johnson syndrome, cannot be overlooked. None of the antihelminthics were prescribed with advice to be taken with meals. A common ADR from taking these drugs on an empty stomach is acute abdominal pain. Also their bioavailability is increased when taken with a fatty meal<sup>31</sup>.

## Conclusions

This study has revealed inappropriate drug prescriptions in the paediatric outpatient clinic of the Lagos State University Teaching Hospital. These include the low rate of prescriptions in generic names; extensive polypharmacy; and inappropriate prescription of vitamin B complex and multivitamin supplements. An algorithm for treating common childhood conditions seen at this centre needs to be developed and circulated among doctors attending to these children. Having a handbook of the national formulary for easy referencing before prescribing will go a long way to minimising inappropriate drug prescriptions. Also, continuous medical education with focus on rational drug use and evidence based medicine should form part of the programme of the hospital.

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