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ANTIBIOTICS PRESCRIPTION PATTERN AMONG PEDIATRICS AT THE UNIVERSITY MEDICAL CENTRE, UNIVERSITY OF NIGERIA, NSUKKA: A RETROSPECTIVE STUDY

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ABSTRACT

Pediatrics are more vulnerable to irrational antibiotic prescribing and misuse. Inappropriate use of antibiotics, can increase morbidity, mortality, healthcare costs, and largely antimicrobial resistance. The study aimed to determine antibiotics prescription pattern among pediatrics. Retrospective cross-sectional study was carried out from July-August 2022, using folders and prescriptions of pediatrics (age 1 month to 156 months) diagnosed between January 2020 and May 2022 at the University of Nigeria Medical Centre. About 282 medical folders and prescriptions were analyzed. Majority of patients were males (57.4%) and about 65.6% belongs to age group 1 month to 60 months with mean age of 60.62± 39.06 months. More than half of patients were treated empirically (64.2%). Malaria and URTI were the most common reasons for hospitalization among children which accounted for 27.92% and 12.65% respectively. The most commonly used antibiotic was Amoxycillin-Clavulanic acid 69(25.84%) followed by Azithromycin 38(14.23%). Oral medication was the most commonly prescribed 221(82.77%). Most commonly encountered class of antibiotics was penicillin 96 (35.96%). Majority of the antibiotics administered were broad spectrum antibiotics 186 (77%) without following the guideline for antibiotic use and average cost of drug per prescription was 2896.32±1267.756 Naira. The findings indicate that antibiotics were prescribed irrationally in the study facility. There was an overuse of penicillin and cephalosporins, mostly among younger pediatrics, without lab tests, which could lead to resistance.

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INTRODUCTION

Antibiotics are essential drugs for the treatment and prevention of infectious diseases, and they are among the most commonly prescribed drugs in pediatrics.[1] Appropriate use of antibiotics is necessary for early recovery and to prevent bacterial resistance. [2] Developing countries are less conscious of the rational use of antibiotics than developed countries. [3] Antimicrobial resistance among broad spectrum pathogens is a major concern for African countries, particularly Nigeria, where access to care and broad-spectrum antimicrobials is frequently limited.[4,5]

The high prevalence of infectious diseases in low-resource countries necessitates the frequent use of

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antibiotics. Although antibiotics should be used on a trial basis,[6]they are overprescribed. Irrational prescribing is a global problem.[7]The rationality of antibiotic prescribing patterns is critical because bad prescribing habits such as misuse, overuse, and underuse of medicines can lead to unsafe treatment, disease exacerbation, health hazards, economic burden on patients, and resource waste.[8] Polypharmacy, insufficient dosage, and the use of antimicrobials even for non-bacterial infections are examples of irrational medicine use. Other examples include excessive use of injections when oral forms are available and appropriate, self-medication, and non-compliance with dosing regimens.[3,9]

Most studies from Nigerian tertiary hospitals focused on prescriptions for adult out-patients, leaving a knowledge gap for pediatric in-patients and out-patients [4,5,10,11]. The World Health Organization's (WHO) prescribing indicators (Table 1) and the Index of Rational Drug Prescribing (IRDP) are widely accepted as the fundamental minimum standard for promoting rational drug use, monitoring, and evaluating drug utilization [12-14]. The few studies on pediatric prescribing pattern that are available are old, and none assessed antibiotics prescribing pattern in south east Nigeria, indicating a paucity of information on pediatric antibiotics prescribing pattern; thus, this study aims to determine the antibiotic prescription pattern among pediatrics at the University of Nigeria Medical Center.

MATERIALS AND METHODS

Study Design

The study was a descriptive retrospective design study involving inpatient prescription orders of children.

Study Duration

The research was conducted between July - August 2022.

Study Population

The study used medical folders from all pediatrics who presented to the hospital during the study period, which included all pediatric prescriptions written between January 2020 and May 2022 at the University of Nigeria Medical Centre.

Study Center

University medical center has about 100-bed capacity that provides health-care services for both university staff and Nsukka community. The facility has a pediatrics unit which attends to both admitted and out-patients. There has neither been any drug monitoring activity nor antibiotic stewardship program conducted in the hospital before and during the study period.

Data Collection

A proforma was designed and used to collect all patient data such as age, gender, diagnosis, laboratory test, antibiotics indicated, route of antibiotic administration, pharmacological class of antibiotics, antibiotic combination, antibiotic cost, and total cost of prescription. The following drug use indicators were also evaluated: Average number of drugs prescribed per patient, percentage of antibiotic encounters, percentage of injection encounters, percentage of drugs prescribed by generics, percentage of drugs prescribed from the Essential Drug List (EDL). The patient demographic data, WHO prescribing indicators (average number of antibiotics prescribed per patient encounter, percentage of drug prescribed by generic name, percentage of encounters with injection prescribed percentage of drug prescribed from EDL and percentage of prescription including antibiotics), total cost of prescription, cost per antibiotics, diagnosis, route of antibiotics and pharmacological classes of antibiotics prescribed were all obtained.

Parameters Studied:

*Index of Poly Pharmacy***:** The parameter used was average number of drugs per encounter. It was calculated by dividing the optimal level with the study value.

*Generic Prescribing Index***:** The parameter used was percentage of drugs prescribed by generic name. It was calculated by dividing the study value with the optimal level.

Index of rational Antibiotic Prescribing: The parameter used was percentage of encounters with an antibiotic prescribed. It was calculated by dividing the optimal level with the study value.

Index of rational Injection Prescribing: The parameter used was percentage of encounters with an antibiotic prescribed. It was calculated by dividing the optimal level with the study value.

Essential Drug Index: The parameter used was the percentage of drug prescribed from the essential drug list. It was calculated by dividing the study value with the optimal level.

Divide the study value with the optimal level since the optimal level is 100% for these two parameters.

Exclusion Criteria

Prescription orders that were not legibly written and were deemed unreadable, as well as those containing only intravenous infusions, consumable items, and vaccines, were excluded. Prescriptions that lacked pertinent client identification (age, registration number, and ward address) were excluded from the study. Prescriptions that were rewritten or repeated with the same drugs were also excluded from the study.

Table 1: WHO prescribing indicators

WHO prescribing indicators (%)	Optimal level (%)	Optimal index score
Non-polypharmacy prescriptions	≤3	1
Drugs prescribed by generic names	100	1
Prescriptions with antibiotics	≤30	1
Prescriptions with injections	≤10	1
Drugs prescribed from the EDL	100	1

EDL=Essential drug list

Data Analysis

Data was entered into an Excel spreadsheet using a computer. IBM SPSS Version 25.0 (Chicago, USA) was used to analyze the data. To summarize data, descriptive statistics were used. The IRDP was calculated using previously validated methods. [12] The parameters derived from the WHO prescribing indicators mentioned above were used to calculate it. [12,13] Results were presented as frequencies and proportions, contingency tables, and charts. Means and percentages were also calculated.

Ethical Considerations

Ethical approval was obtained from University of Nigeria Teaching Hospital Enugu's Review Board - NHREC/05/01/2008B-FWA00002458-1RB00002323, before commencement of the study.

RESULTS

A total of 282 paediatric prescriptions were analysed. The average number of medicines per prescription was 4.84±1.30 (Table 2). The percentage of drugs prescribed by generic was 58.24% and 71.42% was prescribed from the essential drug list (EDL). Table 2 also showed that 34.8% and 85.5% of the prescriptions had at least an injection and an antibiotic prescribed respectively. The index of rational drug prescribing value calculated from the observed WHO prescribing indicator obtained at the University Medical Centre was irrational since the total value obtained (2.55) was less than 5 which is the optimal value (Table 3). Majority of the patients in the study were male between the age ranges of 1 month to 60 months.

Out of 282 pediatric patient folders analyzed in this study, 181 (16.2%) had got empirical diagnosis for their illness and 101 (35.8%) had laboratory diagnosis for their illness (Table 4). Malaria was the most common reason for hospitalization and treatment accounts for 117 (27.92%). While helminthiasis was the least common cause for hospitalization among the children studied (Table 5).

About two hundred and forty-one (241) prescriptions contained antibiotic out of a total of 282 prescriptions collected in this study and accounted for 85.5% and the most commonly encountered antibiotic was Amoxicillin-Clavulanic acid (26%) followed by Azithromycin (14%) (Table 6).

Figure 1 describes the frequency of antibiotic class prescribed. Penicillin (96) was the most frequently prescribed antibiotic. Figure 2 depicts the percentage of antibiotic administration routes. The oral route of administration had the highest percentage (83%). Figure 3 depicts the range of activities of prescribed antibiotics. About 77% of the antibiotics prescribed were broad spectrum.

DISCUSSION

This study examined antibiotic prescription patterns in children and irrational antibiotic prescribing was observed, particularly in children under the age of five. [11] The predominance of male gender and younger age group could be a reflection of the larger infectious disease burden among under-five children. The male preponderance found has similarly been observed in previous reports of studies on prescriptions for children admitted to hospitals in South Africa, Pakistan, India, and Tanzania [3,7,8,14].

A quarter of all prescription orders contained more than three drugs, indicating a polypharmacy tendency. According to the WHO prescribing indicator, polypharmacy is encountered when the average number of drugs prescribed is more than

three. [12,13] Though WHO standard value was obtained largely from adult outpatient population across developing countries (with fewer pediatric prescriptions), [13] however they remain the only valid reference standards available for comparison. When comparing the results of this study to those obtained in Pakistan and India [7,8], it reported contrasting findings of an average of 2.6 drugs per encounter, whereas our study had an average of 4.84±1.30 drugs per encounter, which is significantly higher than the WHO standard. Caregivers' pressure on prescribers to provide medication for all symptoms or conditions, even

Table 2: WHO core prescribing indicators assessed from drug prescriptions

Prescribing Indicators	Average/Percentage
Average No of drugs per encounter	4.84±1.30
Percentage of drugs prescribed by generic name	58.24%
Percentage of encounters with an antibiotic prescribed	85.5%
Percentage of encounters with an injection prescribed	34.8%
Percentage of drugs prescribed from EDL	71.42%

EDL-Essential Drug List

Table 3: Index of Drug Prescribing value

INDICES	VALUES
Index of polypharmacy	0.62
Generic prescribing index	0.58
Index of rational antibiotic prescribing	0.35
Index of rational injection prescribing	0.29
Essential drug index	0.71
IRDP Total	2.55

IRDP-Index of Rational Drug Prescribing Value

Table 4: Socio-demographics of pediatric patients

Demographic characteristics	Frequency	Percentage (%)
Sex		
Male	162	57.4
Female	120	42.6
Age Category of patients (months)		
1-60	185	65.6
61-120	63	22.3
121-156	34	12.1

Table 5: Diagnosis and Presence of (MC&S) laboratory investigation

Diagnosis	Frequency	Percentage (%)
Malaria	117	27.92
URTI	53	12.65
Gastroenteritis	21	5.01
Conjunctivitis	6.00	1.43
LRTI	37	8.83
Helminthiasis	3.0	0.73
Combination	137	32.70
Others*	45	10.74
Lab. Done		
Yes	101	35.8
No	181	64.2

** Others- Sepsis, Dermatitis, wound/sore, enteric fever, loose stool, cellulitis, abdominal discomfort, dermatitis, chicken pox, gingivitis, amoebiasis, fever, colitis, nail injury, fungal infection, impetigo, urticaria pedis, skin sepsis, allergy, epigastric pain, urticaria, measle, furunculosis, dental caries, mumps, scabies, pud, tinea capitis, gynecomastia, UTI and asthma.*

Table 6: Pediatric Antibiotic Prescriptions Pattern

Antibiotics	Frequency	Percentage (%)
Azithromycin	38	14.23
A+C	69	25.84
Cefixime	23	8.61
Cefuroxime	27	13.86
Erythromycin	24	8.99
Gentamycin	2	0.75
Amoxicillin	24	8.99
Chloramphenicol	3	1.12
S+T	3	1.12
Ceftriaxone	**5**	1.87
Ampiclox	2	**0.75**
Cefdinir	1	0.37
Penicillin G	4	1.50
Ciprofloxacin	3	1.12
Cefoxitin	1	0.37
Ofloxacin	1	0.37
Combination	27	10.11

A+C = Amoxicillin + Clavulanic acid; S+T= Sulfamethoxazole + Trimethoprim

Table 7: Mean cost (Naira) of Antibiotic class per prescription for Pediatric Patients

Antibiotics class	Mean ± SD (Naira)
Penicillin	1755.21± 837.962
Cephalosporin	1729.71 ± 767.793
Macrolide	1143.23 ± 643.820
Fluoroquinolone	645.00 ± 110.000
Aminoglycoside	1700.00 ± 934.077
Sulphonamide	1100.00 ± 866.025
Chloramphenicol	633.33 ± 585.947

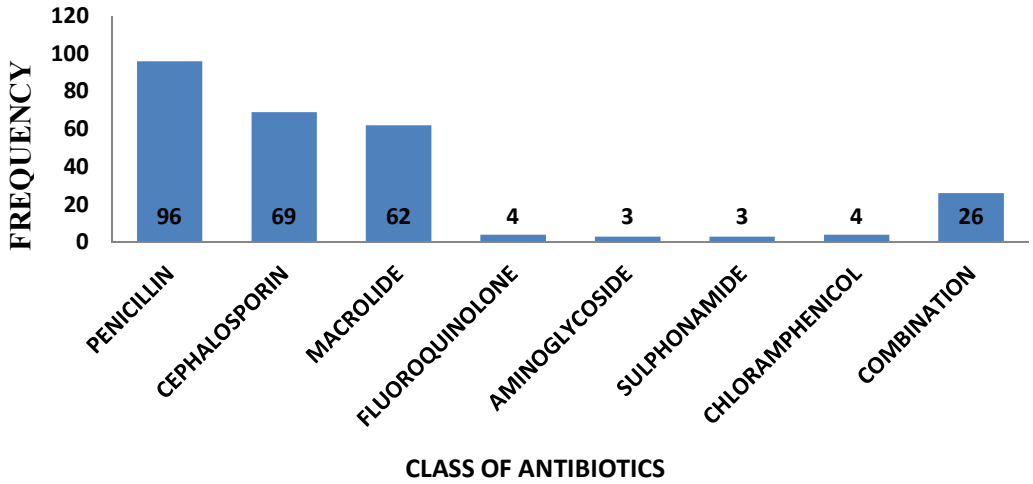

Figure 1: Frequency of antibiotics class prescribed

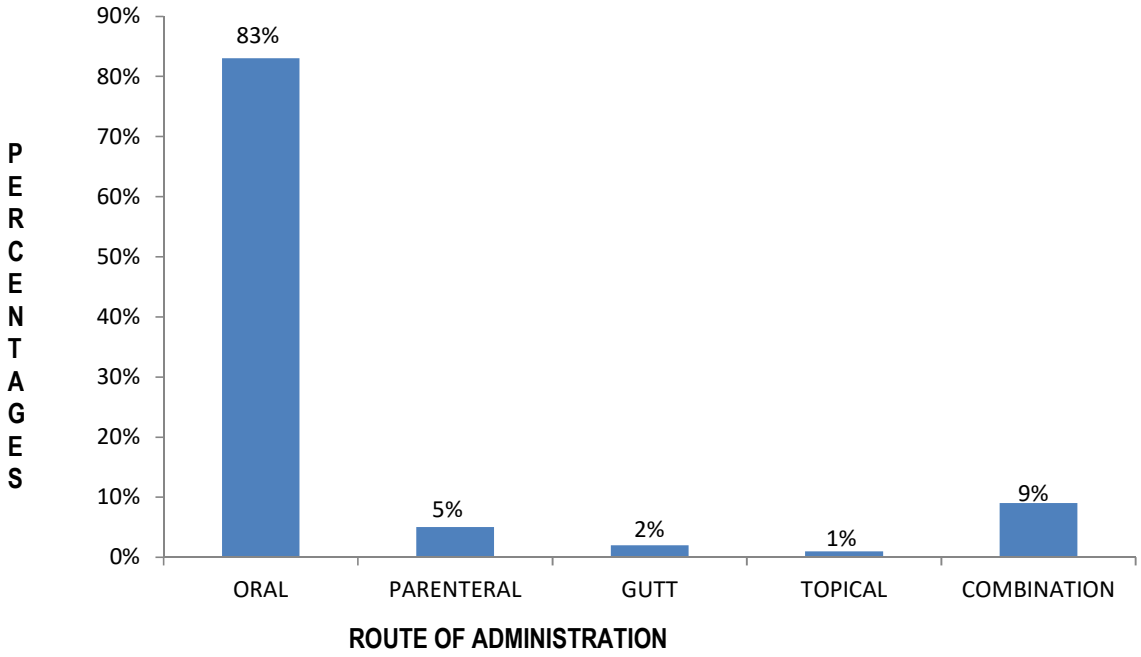

Figure 2: Percentage route of administration

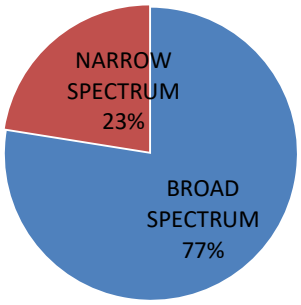

Figure 3: Spectrum of activities of prescribed antibiotics

those that are self-limiting, and a lack of differential diagnosis are known to influence doctors' prescribing practices. These factors could have contributed to the polypharmacy found in this study. Polypharmacy has been shown to increase the burden of health-care costs, as well as to lengthen hospital stays due to adverse reactions and drug interactions. [7, 15,16]

The use of generic names in prescription writing is an obvious practice found in roughly half of the prescriptions examined. This is, however, less than the WHO standard of 100%. This finding implies that brand names are frequently used in prescription writing by doctors at this hospital. In a given health setting, generic prescribing promotes better communication and understanding among health care providers while also lowering the cost burden on consumers. [17] This finding is consistent with the findings of a similar study conducted in Ethiopia [18], but differs from that conducted in Nigeria, where 41% of medicines prescribed were generics [5,11]. The near-high generic prescribing value observed is most likely due to increased physician compliance with the Essential Drug List (EDL), as evidenced by the percentage of drugs prescribed from the list.

However, low generic prescribing rates from these studies in northern and southern Nigeria suggest an undue influence of mentors' and pharmaceutical sales representatives' prescribing habits (as alternative source of drug information available to prescribers) [5,11,15]. In comparison, the proportion of prescriptions with generic names in our study is significantly lower than the 71% reported in Sierra Leone [19] but significantly higher than the 48.9% reported in India [20]. This demonstrates the importance of educating physicians on the importance of prescribing generics rather than brand names, as seen in all hospitals studied. Implementing interventions to monitor and ensure drug prescribing from the EDL, which is mostly made up of generics, could, on the other hand, mitigate trends in non-generic prescriptions. [20].

Cole et al [19] reported that approximately 75% of prescriptions contained antibiotics, which is similar to, but less than, what was discovered in this study. It is reasonable to assume that children under the age of five in this study received more antibiotics in their prescriptions as a result of their vulnerability to infectious disease, which has been recognized in the global epidemiology of child morbidity and mortality [12].

In a study conducted in Northern Nigeria by Umah LW and Isah A [5], approximately 74.6% of drugs administered to children in the facility were antibiotics, with approximately half being injections.

A similar study among admitted children in Sierra Leone found 20% lower injection prescribing rates [19]. Malaria was the leading cause of hospitalization in children under the age of five, followed by URTI, LRTI, and gastroenteritis. This is consistent with Nigeria's status as a malaria-endemic country. The two most commonly prescribed antibiotics for diseases such as gastroenteritis, upper respiratory tract infections (URTI), and lower respiratory tract infections were amoxicillin-clavulanic acid combination and azithromycin. This could be due to their effectiveness in these conditions as well as their regular availability at the study site.

The majority of antibiotics were administered orally, followed by parenterally and by a combination of the two routes. The WHO recommends that injections be used less frequently because they help to reduce treatment costs.[12]. Children are observed to be more comfortable with dosage forms like syrup, tablets and drops compared to injection [17]. This will probably lead to increased compliance and help in the completion of the treatment.

LIMITATIONS OF THE STUDY

This study had some limitations which includes; the use of a single study site and the fact that it was purely a descriptive study design. As a result, there is no qualitative component in the methods for determining the appropriateness of and underlying factors influencing prescribing, particularly and selective use of parenteral route of administration. As a result, additional research is required to fill these gaps.

CONCLUSION

This study provides baseline data on rational prescribing for children admitted to a medical center, which can then be used to make objective comparisons with future assessments as part of interventions to monitor and evaluate prescribing practices. The findings indicate irrational prescribing practices or programs and strict prescribing policies, such as the implementation of antibiotic stewardship programs, as well as reorientation on evidence-based rational use of medicines for all physicians in Nigerian teaching hospitals and academia.

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