

Prescription of medicines for the management of childhood acute watery diarrhoea at a tertiary hospital in Ebonyi state, Nigeria

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ABSTRACT

Background: The burden of childhood diarrhoea in Nigeria is huge and has been persistently high over the years with an estimated 205 under-fives dying daily. A simple combination of oral rehydration salts (ORS) and zinc tablets (ORS/Zinc) has been approved for its treatment by the WHO since it is beneficial for rehydration which is the goal of therapy. However, huge resources are spent on antibiotics and other medications which are not beneficial for rehydration, thereby exposing children to unnecessary medications and other drug therapy problems. This study was set to evaluate the prescription of medicines for acute watery diarrhea (AWD) in under-five children and to determine the appropriateness of these prescriptions.

Method: This study was conducted in a tertiary hospital in Abakaliki, Ebonyi State. It was a retrospective review of prescriptions of medicines for AWD in under-fives for a period of 28 months (January 2019 to April 2021). All available cases of AWD (338) were extracted from the prescription registers. Data were entered into SPSS version 24.0 and descriptive analysis was done. The guideline set by WHO for the management of AWD was followed for evaluating the prescriptions.

Results: Out of the 338 cases of AWD, 190 (56.2%) occurred in male children and 265 (84.4%) in children under 24 months. Of the total cases, 291 (86.1%) received prescriptions containing ORS, zinc, and probiotics either alone or in different combinations with only 154 (45.6%) containing ORS and zinc together. Of these prescriptions with ORS/Zinc, 47 (30.5%) also contained antibiotics, antimalarials and infusions. In total, there were 99(29.3%) and 48 (14.2%) prescriptions containing antibiotics and antimalarials respectively. The most frequently prescribed antibiotic classes were sulfonamides (41; 40.6%), cephalosporins (29; 28.7%) and fluoroquinolones (13; 12.9%). Less prescribed antibiotic classes include macrolides, penicillins and nitroimidazoles. Other groups of medicines prescribed were analgesics, anthelmintics, oral potassium and antacids, and antihistamines. Overall, only 107 (36.8%) prescriptions were appropriate for the management of AWD.

Conclusion: This study revealed that only 36.8% of AWD cases received appropriate prescriptions according to guideline. Therefore, there is urgent need for intervention in the study setting to improve appropriate treatment of AWD.

1. Introduction

Diarrhoea has remained the second leading cause of deaths among under-fives globally claiming 437,000 lives in 2018.¹ This is equivalent to 52 deaths per hour or 1,241 deaths per day. While the global diarrhoea deaths seem to have consistently dropped over the years, a recent survey showed that the low and lower middle-income countries bear the burden of these deaths, with diarrhoea responsible for 90% of under-five deaths; and South Asia and Sub-

Saharan Africa accounting for 88%.² In Nigeria, an estimated 205 deaths occur daily among under-fives, and this is reflected in Southeast Nigeria where the economic burden of acute watery diarrhoea is huge especially among the low socio-economic group.^{3,4} The current diarrhoea deaths in Nigeria is an indication of improper response to diarrhoea, represented as inadequate home management by under-five caregivers or inappropriate management by health providers in varying sources of care such as

proprietary and patent medicine vendors, community pharmacies, primary healthcare and secondary health facilities⁵⁻⁹

Diarrhoea is defined as the passing of watery/loose stools three or more times in 24 hours.¹⁰ Diarrhoea inadvertently leads to dehydration and death if not managed correctly and timely. Hence the goal of therapy in diarrhoea is rehydration with appropriate fluids to restore and maintain electrolyte balance. The use of a simple solution of oral rehydration salts (ORS) in combination with zinc supplementation has been proven to achieve rehydration and avert death; and it is the gold standard of care.¹¹ The utilization of antibiotics is reserved for cases of dysentery, cholera, and some cases of persistent diarrhoea, and these occur in only one out of twenty cases of diarrhoea in children.¹⁰ Yet huge resources are currently spent on antibiotics, and other medications annually, most of which are ineffective for rehydration purposes or even harmful to the children. The irrational use of antibiotics especially in the treatment of acute watery diarrhoea is a worldwide problem, and one of the main reasons for this excessive use of antibiotics is the failure to follow clinical guidelines.¹² Therapeutic guidelines have been issued by the World Health Organization (WHO), which aim at facilitating the use of ORS/Zinc and reducing the inappropriate use of antimicrobials, anti-diarrhoeals and other medications in treatment of diarrhoea. The effectiveness of such guidelines can be evaluated by drug utilization research.¹⁰ Antibiotics use has been found to be associated with prolonged hospital stay in children with acute watery diarrhoea when compared to children who did not receive antibiotics.¹³ It is therefore important that health care professionals have clear information on the risks of inadequate diarrhoea treatment in children under five years.¹²

Despite the availability of this simple and effective treatment for diarrhoea, as well as guidelines for its management, mortality in low- and middle-income countries remain unacceptably high with some countries bearing the burden. The challenge of using ORS/Zinc spans through both under-five caregivers and health providers. Studies done among caregivers in Nigeria show inappropriate and inadequate management, and low level of knowledge and practice of home management.^{8,14,15} Studies done among health providers in primary and secondary health care settings found very low level of prescription and recommendation of the evidence-based treatment of ORS/Zinc as well as inappropriate use of antibiotics and other medications that are not beneficial for rehydration.^{5,9,16-18} These studies are indications that regular

audit of prescriptions at all levels of care most importantly help in identifying unwarranted variation in effective care and patient safety which translates to failure to deliver effective care.¹⁹

This study was conducted in a tertiary institution because there is dearth of information on the use of medicines for childhood acute diarrhoea at this level of care. The tertiary institution is the highest level of healthcare providing care for specialized disease conditions by experts in the fields. Patients are only registered to receive care in tertiary institutions by referral. However, studies have shown that patients and caregivers still access care at tertiary institutions for conditions that could have been handled at the primary healthcare level without referral or through self-referral.²⁰⁻²² The implication of attending tertiary institution to receive treatment for a primary care disease is waste of time and resources that could have been used in dealing with more specialized cases. In addition, patients would supposedly receive effective care because of the type of providers in the facilities. Therefore, this study aimed to evaluate the prescription of medicines for acute watery diarrhoea (AWD) in under-five children without comorbidities and to determine the appropriateness of these prescriptions at this level of care.

2. Methods

Study settings: This study was carried out in Children's Out-patients clinic of Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AE-FUTHA) Ebonyi State, Nigeria, located on 0608.29°N and 0808.627°E. Ebonyi State is a relatively small state in the south of the eastern region of Nigeria, with an estimated population of 2,880,383 out of which approximately 12.1% are under the age of five. It is inhabited and primarily populated by the Igbo tribe, with their main occupation being farming.^{23,24} The state has 13 secondary health facilities, 417 primary health facilities, and 119 private hospitals/clinics and several community pharmacies, and patent and proprietary medicine vendors. There is only one tertiary hospital located at Abakaliki, the largest city and capital of the state. The population of children under five years that accessed care at the hospital in 2021 alone was estimated to be 13,255, higher than attendance in 2020 during the beginning of the COVID-19 pandemic.

2.1 Study design: This study was a retrospective review of prescribing records for all acute watery diarrhoea cases in children encountered from January 2019 to April 2021. The 28-month period was used to ensure adequate number of

cases for evaluation, as well as meet the minimum sample size, especially because patients stayed away from the facility during the beginning of the COVID-19 pandemic.

2.2 Study population: The study population included children between 6 months and 59 months who presented and were treated for acute watery diarrhoea in the hospital, within the study period.

2.3 Sample size/technique: A minimum sample size of 323 was calculated using the formula $n = Z^2 pq/d^2$ (where $z = 1.96$, $p = 0.4$, $q = 0.6$, $d = 0.05$). P is the prevalence of appropriateness of prescription from a recent study conducted at secondary health facilities in Lagos state.⁹ In spite of the calculated sample size, all cases of diarrhoea presented to the hospital within the study period were included in the data collection.

2.4 Data collection: A standardized data collection proforma, developed by the World Health Organization (WHO) was adopted for this study.²⁵ Information was extracted from Children's Out-patient clinic registers where all prescribing details were recorded. Information collected include date of prescription, gender of child, age of child (in months), complaints of the child, diagnoses by the physician, investigations done, and medicines prescribed as indicated in the registers.

Data analysis: Collected data were coded and analyzed using Statistical Package for Social Sciences (SPSS) Version 24.0. Results were presented as frequencies and percentages and displayed in tables, bars, and pie charts. Appropriateness of prescription for cases of AWD alone was defined as the prescription of ORS/Zinc without addition of antibiotics, antimalarials and anti-diarrhoeals. Inappropriate prescription was defined as prescriptions containing antibiotics, antimalarials and anti diarrheal medication with or without ORS/Zinc.

Ethical approval: Ethical Approval was obtained from Health Research and Ethics Committee of Alex Ekwueme Federal University Teaching Hospital, Abakaliki (AE-FUTHA/REC/VOL3/2021/202).

3. Results

3.1 Basic characteristics of children with diarrhoea: A total of 338 cases of acute watery diarrhoea (AWD) were reviewed. There were 190 (56.2%) cases for male children, 141 (47.7%) were under 12 months old with mean age at 16 months \pm 12.15. the 36-47 age category had the lowest occurrence of diarrhoea (11; 3.3%) within the study period (Table 1).

Table 1: Basic characteristics of children with diarrhoea

Variable	Characteristics	Frequency (%)
	Male	190 (56.2)
	Female	148 (43.8)
	<12	141 (47.7)
	12 – 23	124 (36.7)
	24 – 35	45 (13.3)
	36 – 47	11 (3.3)
	48 – 59	17 (5.0)

3.2 Prescription of medicines: Out of 338 cases of AWD, 291 (64.8%) received prescriptions containing ORS and/or zinc and/or probiotic. Out of these 291, 80 (27.5%) received prescriptions for ORS/Zinc/probiotic; 74 (25.5%) for ORS/Zinc; 47 (16.2%) for zinc alone; and 45 (15.5%) for zinc/probiotic. Ninety-nine (29.3%) prescriptions contained antibiotics medications either as one antibiotic (96), two antibiotics (2) or intramuscular injection (1). Forty-eight prescriptions (14.2%) contained anti-malarial medications (Table 2).

Table 2: Prescription of medicines

Variable	Characteristics	Frequency (%)
	ORS/Zinc/Probiotic	80 (27.5)
	ORS/Zinc	74 (25.4)
	Zinc alone	47 (16.2)
	Zinc/Probiotic	45 (15.5)
	ORS alone	25 (8.6)
	Probiotic alone	12 (4.1)
	ORS/Probiotic	8 (2.7)
	One oral antibiotic	96 (97.0)
	Two oral antibiotics	2 (2.0)
	Injection antibiotic	1 (1.0)
	Oral anti-malarial	47 (98.0)
	Injection anti-malarial	1 (2.0)

Forty-seven (47) prescriptions containing ORS/Zinc also contained antibiotics (29; 61.7%), antimalarials (11; 23.4%), antimalarials and antibiotics (6; 12.8%) or infusions (1; 2.1%). Six classes of antibiotics were prescribed with the sulfonamides and Trimethoprim being the highest (41; 40.6%), and the Nitroimidazoles, the lowest (4; 4.0%) (Figure. 1).

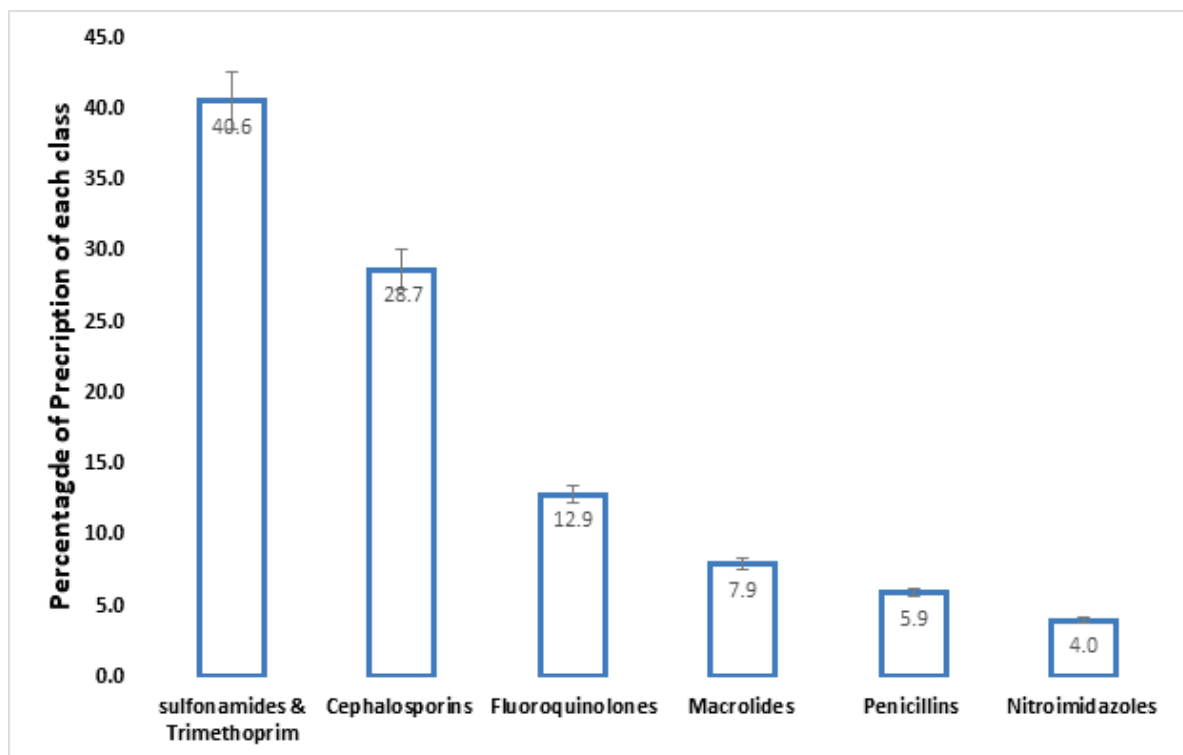


Fig 1: Classes of Antibiotics Prescribed to Paediatric Patients

Other medications include analgesics (30; 46.9%) infusions (10; 15.6%), anthelmintics (7; 10.9%), vitamin A (6; 9.4%) and other vitamins/iron (4; 6.3%). There were also prescriptions for antacids (3; 4.7%), oral potassium (2; 3.1%) and antihistamines (2; 3.1%).

3.3 Appropriateness of prescriptions Using the guideline, only 107 (36.2%) prescriptions were appropriate for the management of diarrhoea in under-five children. The remaining 281 (63.8%) cases received inappropriate prescription for AWD.

4. Discussion

This study was set to evaluate the prescribing of medicines for acute watery diarrhoea in under-fives, with the goal of determining the appropriateness of prescriptions in a tertiary healthcare facility. The study identified unwarranted variation in effective care and patient safety for this disease condition which already has its algorithm and guidelines for treatment.

This study showed that more male children (52.2%) presented at the hospital with AWD. While predominance of diarrhoea in male children cannot be ascertained or explained, there is an assumption that male children are more likely to be brought to the hospital for treatment because of the high value placed on sons in the culture of the study setting as well as other cultures as evidenced in studies carried out in China, Enugu and Anambra States in Nigeria.²⁶⁻²⁹ In China, there is female deficit because of strong preference for the male child.²⁸ Other studies have reported that even though there has been a considerable weakening of son preferences, male to female sex ratio at birth remains high because a small proportion of individuals still carry out sex selective abortion to ensure male offspring.²⁶ The Igbos, the predominant tribe of the study setting, are traditionally patriarchal. The male child is trained very early in life to see himself as superior to the females.²⁷ Thus; the male child is seen as being very important by both men and women in the traditional Igbo society. Ohagwu *et al*, in their study carried out in Anambra State, an Igbo tribe in Nigeria, noted that the male gender preference is strongly perceived by Igbo women irrespective of age, formal education attainment, number of co-wives married by their husband and number of male and female children already had.²⁹ Hence, male children tend to be given more care and attention even when it comes to health.

Our study showed that most of the children (47.7%) who were managed at the facility for AWD were less than 12 months confirming the vulnerability of this age category to diarrhoea.³⁰ This is like a study done in India where 45% of their study population was less than 12 months.³¹ Possible

explanations to this observation are weaning from breast feeding and the crawling stage which occur at about 6-8 months. Children at these stages are therefore exposed to contact with the floor, where they pick up contaminated objects into the mouth and then get infected especially because of lack of proper hygiene and feeding practices. In addition, maternal antibodies decline at this age while the child is still building up its own defenses against infections. All these may make children, under 12 months more vulnerable to acute diarrhoea.³¹

This study confirmed the empirical prescription of antimalarials (14.2%) in both oral and parenteral forms. These are unnecessary and inappropriate as there was no evidence of malaria parasite from the tests done and from the diagnoses given. This is lower than findings from a study done in primary healthcare facilities in Lagos, Nigeria where 24.8% of the prescriptions for AWD contained oral and parenteral anti-malarial medications.¹⁸ The clinical implication of this prescribing practice is unnecessary exposure of children to antimalarials which are basically the Artemisinin Combination Therapies (ACTs) and their inadvertent drug therapy problems. Furthermore, there is the risk of initiating resistance to ACTs.

The prescription of antibiotics in this study at (29.3%) is close to 34.1% and 30.4% found in two studies conducted at Secondary and Primary Health Facilities in Lagos Nigeria. Other authors found much higher antibiotics prescribing in other health facilities in Abakaliki, the same city as our study setting (86.9%), Calabar another part of Nigeria (79.9%) and Tanzania (80.9%).^{9,18,32-34} The use of antibiotics is not in line with WHO recommendations and the guidelines for managing childhood diarrhoea. This is because majority of AWD cases are of viral origin and antibacterial agents are unnecessary, ineffective, and have no proven value.¹⁰ Inappropriate use of antibiotics leads to development of antibiotic resistance thereby putting lives at risk when the need arises. In addition, antibiotics are costly; hence money is wasted where the use of antibiotics is unrestricted.¹² This observed unrestricted and inappropriate use of antibiotics calls for the initiation and implementation

of antibiotic stewardship program at the study setting. Our study found prescriptions for zinc supplementation and probiotics either alone or in combination. These products are not beneficial for rehydration even though they have been found to be helpful in reducing recurrence and duration of diarrhoea. Rehydration remains the mainstay of the management of diarrhoea in children. More findings from this study, suggest that the importance of ORS/Zinc in the management of AWD was downplayed. The appropriate prescription of ORS/Zinc in only 36.8% of evaluated cases is low and close to that found in a similar study conducted at Secondary (34.4%) and at Primary (40.3%) Health Facilities in Lagos State, Nigeria.^{9,18} These findings are lower than the 80% target recommended by the Federal Ministry of Health.³⁵ The low appropriateness of prescription for AWD observed in this study is a concern especially because of the study setting. The tertiary institution is the highest level of care and has greater expectation of appropriate treatment for AWD as well as other disease conditions. Furthermore, this study reveals failure to deliver effective care to children experiencing AWD. The clinical implications of our findings include drug therapy problems, risk of dehydration and death. Other implications are inequity, inequality, and the passive transfer of inappropriate prescribing to caregivers who would want to self-medicate with a medicine they have been exposed to in a formal health setting.

This study has revealed inadequate prescription of ORS/Zinc for acute diarrhoea in children as well as unnecessary and inappropriate prescription of antimalarials and antibiotics in both oral and parenteral forms.

Limitation of this study: The 28-month period used in this study is acknowledged as a limitation although it was an attempt to cover-up the scanty hospital attendance during the beginning of the COVID-19 pandemic.

5. Conclusion

This study showed the appropriate prescription of ORS/Zinc for acute watery diarrhoea in only 36.8% of the cases evaluated, and this is inadequate. There were high, unnecessary, and inappropriate prescriptions of antibiotics and antimalarials for AWD in this study. This result clearly shows failure to deliver effective care to children with acute watery diarrhoea even in a tertiary institution. Our study highlights the need for urgent intervention, first to deliver appropriate care to children who need it and reduce the existence of unwarranted variation in effective care and patient safety, and to prevent the development of antibiotics resistance. Emphasis on proper diagnosis, treatment, and

education on the use of WHO guideline may help in realizing better management of acute watery diarrhoea in children. Health-care professionals should have clear information on the risks of inadequate diarrhoea treatment in children under-five.

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