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Original Article

Trend of Drug Utilization among Children with Acute Gastroenteritis in a Tertiary Hospital, Edo State, Nigeria

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ABSTRACT

Background: Inappropriate drug utilization is common in clinical practice with a consequent significant negative clinical burden. This study assessed the drug treatment practices for Acute Gastroenteritis (AGE) among under-five children in a tertiary hospital in south-south Nigeria. **Materials and Methods:** A retrospective cross-sectional study was carried out using prescription records from October 2020 to October 2022; Data was collected using a modified data collection form from World Health Organization (WHO) prescribing indicators, adapted for children's healthcare. A total of 121 prescriptions met the inclusion criteria. Demographic and clinical characteristics, diagnosis, drugs prescribed, and comorbidity of the patients were extracted from the patient's folder. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 22. The analysis was mainly descriptive. Pearson's chi-squared test was carried out to determine the association of patient characteristics with diagnosis. Statistical significance was set at a *p*-value is <0.05. **Results:** Most (56.2%) of the children were males, the age, breastfeeding pattern, and source of drinking water were significantly associated with acute gastroenteritis ($p<0.05$). A total number of 538 medications were prescribed. The average number of drugs per prescription was 4.25±1.19. Zinc tablets (21.4%) and ORS (21.4%) were the most prescribed drugs, followed by flora-norm (19.9%), 43% of drugs were prescribed by generic name and 38% of patients had co-morbidity. **Conclusion:** A high level of polypharmacy was observed in this study, age, breastfeeding pattern and sources of drinking water were major associated factors with gastroenteritis. Good hygiene and nutritional practices are thereby recommended to children's caregivers.

Keywords: Gastroenteritis, Diarrhea, Prescribing pattern, Drug utilization, Children.

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INTRODUCTION

Children, especially those under five, are considered to be more vulnerable to Gastroenteritis (AGE). Based on estimates from the World Health Organization (WHO),[1] over 525,000 children under five die from gastroenteritis annually; most of these deaths occur in developing countries.[2] Roughly nine percent of baby deaths globally occur from diarrhea, making it the second most common cause of death in children under the age of five.[3] The 1.8 million deaths annually from diarrheal diseases in developing nations are attributed to more than 80% of children under five.[4,5] Every year, 151,700 children in Nigeria lose their lives to diarrheal illness.[6] According to estimates from the Global Burden of Disease, there were 499,000 fatalities from diarrhea in children under five in 2015. Of these deaths, 42% happened in Nigeria and India.[7] In children, acute AGE is the onset of diarrhea in the absence of a chronic illness and can present with or without fever, nausea, vomiting, or abdominal pain. However, this is usually mild and self-limiting, leading to 220,000 hospital admissions for children under five and 1.5 million yearly visits to primary care physicians.[8]

Patients' access to AGE care may be severely hampered by the wide range of drug use patterns and associated cost of medicines. It is necessary to assess these facts and increase awareness among healthcare professionals to support and manage AGE in compliance with reasonable drug use patterns and WHO treatment recommendations. It is essential to keep an eye on children's medication safety because there is a dearth of data obtained from clinical trials during the clinical development of pharmaceuticals.[9] The use of medicines beyond the license's stated limitations concerning age, formulation, indications, or contraindications is known as off-label or off-license use, and it is a significant area of concern in the treatment of AGE in underage children.

As a result of recent reports on the common practice of prescribing inappropriate drugs that have significant clinical and economic implications, Drug Utilization Review (DUR) has become

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essential for evaluating drug use patterns in healthcare facilities and identifying opportunities for corrective measures to improve the achievement of therapeutic goals and patients' quality of life.[10] Vaccination, hand hygiene, and safe eating and drinking practices are some of the preventive interventions that might reduce the incidence of gastroenteritis in children. Furthermore, gastroenteritis can be treated effectively to reduce complications and lower severity with early detection.

The use of low osmolality Oral Rehydration Solution (ORS), and zinc supplementation, and careful use of antibiotics in all episodes of diarrhea, in addition to breastfeeding, continuing to feed, can help in reducing morbidity and fatality rates linked with AGE. Traditionally, the "doing the least" approach to treating acute AGE has involved early refeeding, abstaining from testing, and avoiding unnecessary medicine. In underdeveloped countries with limited resources, prescribing the wrong medication might have very large costs in addition to the potential consequences for clinical risk. Regular prescription auditing becomes crucial to guarantee the prudent and cost-effective use of drugs, increase efficacy, reduce side effects, and provide feedback for prescribers. The study aimed to evaluate the prescribing trend of drugs for AGE and the caregivers' methods of care among children hospitalized at the University of Benin Teaching Hospital, Benin City.

MATERIALS AND METHODS

Study design

The study is a retrospective cross-sectional hospital base, aimed at evaluating the prescribing trend among children with acute gastroenteritis in a tertiary hospital, Benin City.

Study setting and population

The study was conducted at the University of Benin Teaching Hospital (UBTH), Ugbowo, Benin City, Edo State. Benin City. It is a premier and multi-specialty healthcare provider in West Africa with a bed capacity of over 900 as of August 2019 and still increasing with a multiplicity of departments offering a wide range of specialized health services to the people of Edo State and the neighboring states such as Delta, Ondo, and Kogi. The hospital is equipped with a well-functioning Pharmacy department with 18 clinical service units and qualified pharmacists to meet the needs of the patients. All pediatric patients between zero to five years previously diagnosed with gastroenteritis between 2020 to 2022, were included in the study. Patients with confusing medical information and patient medical folders without specified age, weight, and sex were excluded from the study. 121 patients met these criteria and their records were used in the study.

Data collection

Using a systematic sampling technique, data was collected using a modified data collection form from the WHO prescribing indicator.[11] Patient information such as demographics (age, sex), patient's clinical characteristics such as (immunization status before the time of admission, breastfeeding pattern) other information such as waste disposal methods, sources of drinking water, prior use of ORS, laboratory tests such as stool examination test and culture test, and medications were obtained from the case file. Patient clinical data such as total number of drugs prescribed, Average duration of hospital stay, indications and trends in antibiotics, antiemetics and antidiarrheal used, number of drugs prescribed by generic name, and therapeutic duplications were also collected from the patient's case file. The following outcomes were measured; medication used in gastroenteritis, comorbidities, percentage encountered with antibiotics, generic drug prescriptions, and percentage prescribed drugs in the Essential Drug List (EDL).

Ethical Consideration

Ethical approval with Protocol Number: ADM/E 22/A/VOL. VII/148301958 was obtained from the Ethics Committee of the University of Benin Teaching Hospital. Patients' confidentiality was observed by omitting their names from the data, and all guidelines as per the declaration of Helsinki and good clinical practice guidelines were followed.

Data analysis

Data collected were entered in Microsoft Excel sheet window 10, double-checked thereafter transported and analyzed using the Statistical Package for Social Science (SPSS) version 22. The analysis was mainly descriptive. Pearson's chi-squared test was carried out to determine the association of patient characteristics with diagnosis. Statistical significance was set at p-value <0.05.

RESULTS

Demographic and clinical characteristics of the patients

The mean age of the study participants was 14.02±10.12 years, with a mean weight of 9.73±3.56. More than half (56.2%) of these patients were male. The majority (94.2%) of them were fully immunized and about 50.4% of these patients were exclusively breastfed. Sachet water (47.9%) was the leading source of drinking water. The means of sewage disposal was predominantly through the water cistern (90.9%), while other disposed sewages were in open dumps (Table 1). Most of the patients (31.4%) had acute watery diarrhea, about 28.9% had acute watery diarrhea and other co-morbidities, 17.4% had acute gastroenteritis and 10.7% had dysentery. Less than 12% had either acute gastroenteritis+co-morbidities, dysentery+co-morbidities, or dysentery+acute watery diarrhea (Table 2).

Table 1: Demographic and clinical characteristics of the patients.

Variables	Mean±SD	Frequency	Percent
Mean age± SD (years)	14.02±10.12		
Mean weight (kg)	9.73±3.56		
Age			
Less than 6 months		25	20.7
7-11 months		34	28.1
12-24 months		52	42.9
Above 24 months		10	8.3
Sex			
Male		68	56.2
Female		53	43.8
Immunization			
Partial		7	5.8
Full		144	94.2
Breastfeeding pattern			
Exclusive		61	50.4
Not exclusive		60	49.6
Sources of drinking water			
Sachet water		58	47.9
Bottled water		15	12.4
Tap water		15	12.4
Borehole water		28	23.1
Sachet water and bottled water		3	2.5
Sachet water and borehole water		2	1.7
Sources of sewage disposal			
Water cistern		110	90.9
Open dumping		11	9.1
Laboratory test			
Yes		45	37.2
No		76	62.8
Stool test			
Yes		27	22.3
No		94	77.7
Dehydration status			
No dehydration		84	69.4
Moderate dehydration		34	28.1
Severe dehydration		3	2.5

SD: Standard Deviation.

Prescribing indicators and profile of drugs prescribed

The total number of drugs prescribed was 512, the average number of drugs prescribed per encounter was 4.25+ 1.19, 43, percentage of drugs prescribed by is 40.9%., 77.3% of drugs prescribed were in the Essential Drug List (EDL). Other prescribing indicators were measured as shown in Table 3. Figure 1 provides the profile of prescribed medications by physicians for children with gastroenteritis. The majority of the patients were prescribed ORS (21.4%), and zinc (21.4%) which was closely followed by Floranorm (19.9%), and Cefuroxime (9.9%). Paracetamol (2.2%), cefixime (2.0%), Artemeter-Lumenfantrin

Table 2: Clinical diagnosis of the patients.

Diagnosis	Frequency	Percentages
Acute watery diarrhoea (AWD)	38	31.4
Acute gastroenteritis (AGE)	21	17.4
Dysentry	13	10.7
AWD+CM	35	28.9
AGE+CM	9	7.4
DSY+ CM	2	1.7
AWD+DSY	3	2.5

Where, **AWD:** Acute watery diarrhea, **CM:** comorbidity, **DSY:** Dysentery, **AGE:** Acute gastroenteritis.

Table 3: Prescribing indicators of patients.

Variables	Frequency	Ref. Value
Total number of drugs prescribed.	538	
Average number of drugs encountered.	4.25+1.9	1.6-1.8
Percentage encountered with generics.	40.9%	100%
Percentage of drugs prescribed in EML.	73.6%	100%
Percentage encountered with antibiotics.	48.1%	20-26.8%
Percentage encountered with antidiarrheal.	95.9%	
Percentage of antiemetic encountered.	9.1%	
Percentage encountered with ORS.	95.0%	

(Coartem) (2.0%), and ibuprofen (1.9%), were among the least prescribed medications. More than half (62.0%) of the patients did not have co-morbidities. A good percentage of 19.8% of the patients had acute tonsillitis with gastroenteritis and 9.9% had malaria (Table 4).

Association of patient's demographic and clinical characteristics with diagnosis

Table 5 provides a comparison of the demographics and clinical characteristics of the patients with the diagnosis. Age, breastfeeding pattern, and source of drinking water were associated with diagnosis ($p<0.05$). Gender, immunization status, and sources of sewage disposal were however not found to be associated with diagnosis ($p>0.05$).

DISCUSSION

This study was carried out to assess the compliance level of practitioners to the WHO guidelines for the treatment of acute gastroenteritis. It was observed that the majority of the patients

Table 4: Co-morbidity of the patients.

Diagnosis	Number	Frequency (%)
No Comorbidity	75	62.0
Acute tonsilitis (ats)	24	19.8
Malaria(mal)	12	9.9
Upper respiratory tract infection	5	4.1
Figure Furunculosis	2	1.7
Acute tonsilitis + malaria	2	1.7
Sepsis	1	0.8

were males, a result similar to other studies in India and USA.[12,13] While the predominance of diarrhea in male children cannot be explained, it is assumed that the male children were more active and dominant than the females.

In this study, the mean number of drugs prescribed per patient was 4.25+1.19 (range of 2 to 7). This is similar to a study done in Nepal,[14] but much higher than that in Bangladesh, where the average number of drugs prescribed per patient was 1.5.[15] Hence, it is evident that the practice of polypharmacy was prevalent in this study. The use of polypharmacy is widely documented to be linked to adverse drug responses, prescription errors clinically significant drug interactions, and a higher-than-average hospital admission rate.

The usage of essential drugs and the prescription of generics are crucial metrics for assessing the Rational Use of Medicines (RUM). It was observed in this study that less than half (43.0%) of the drugs were prescribed by generics. Previous studies revealed more frequent use of generic prescribing.[14,16] Other studies in Warri and Osun, showed higher generic prescribing at the public hospital (54% and 69.81%).[17,18] Brand drugs were more prescribed in this study, this can be attributed to the fact that most drugs supplied by hospital pharmacies are brand products, it is most likely that the prescribers are also influenced by the sales representatives of the prescribed medicines. This practice suggests a gap in communication between the hospital pharmacists and the prescribers regarding the list of available drugs. The cost of medication can be reduced using generic names.[19] The Percentage number of drugs prescribed in EDL was 77.3%, which is much lower than the optimal recommended value (100%), this is higher than a study in Ghana where 69.5% of drugs prescribed were found in EDL[20] but lower than other studies in Lagos and Egypt.[21,22] In a developing nation, the use of essential medications provides an affordable answer to a variety of health issues. Drug use is encouraged by information, accessibility, and availability in the EDL.

In our study, ORS and zinc were prescribed in almost every (95.0%) case of AGE documented. This was in line with the current WHO recommendations. Studies carried out in India

Table 5: Association of patient's demographic and clinical characteristics with diagnosis.

Outcomes	AWD	AGE	DSY	AWD+CM	AGE+CM	DSY+CM	AWD+DSY	Total	*p*-value
Age range									
Less than 6 months	12 (48.0)	1 (4.0)	5 (20.0)	7 (28.0)	0 (0.0)	0 (0.0)	0 (0.0)	25 (100.0)	0.0001*
7-11 months	10 (29.4)	5 (14.7)	1 (2.9)	13 (38.2)	4 (11.8)	1 (2.9)	0 (0.0)	34 (100.0)	
12-24 months	15 (28.8)	15 (28.8)	3 (5.7)	13 (25.0)	4 (7.7)	1 (1.9)	1 (1.9)	52 (100.0)	
Above 24 months	1 (10.0)	0 (0.0)	4 (40.0)	2 (20.0)	1 (10.0)	0 (0.0)	2 (20.0)	10 (100.0)	
Sex									
Male	24 (21.1)	11 (9.6)	7 (6.1)	18 (15.8)	4 (3.5)	1 (0.9)	3 (2.6)	68 (100.0)	0.663
Female	14 (26.4)	10 (18.9)	6 (11.3)	17 (32.1)	5 (9.4)	1 (1.9)	0 (0.0)	53 (100.0)	
Immunization state									
Partial	2 (28.6)	3 (42.9)	0 (0.0)	2 (28.6)	0 (0.0)	0 (0.0)	0 (0.0)	7 (100.0)	
Full	36 (1.6)	18 (15.8)	13 (2.6)	33 (28.9)	9 (7.9)	2 (1.8)	3 (2.6)	114 (100.0)	0.615
Breastfeeding pattern									
Exclusive	21 (35.0)	9 (15.0)	9 (15.0)	14 (23.3)	2 (3.3)	2 (3.3)	3 (5.0)	60 (100.0)	0.043*
Not exclusive	17 (27.9)	12 (19.7)	4 (6.6)	21 (34.4)	7 (11.5)	0 (0.0)	0 (0.0)	61 (100.0)	
Source of drinking water									
Sachet water	14 (36.8)	11 (28.9)	8 (21.1)	19 (50.0)	5 (13.2)	0 (0.0)	1 (2.6)	38 (100.0)	0.041*
Bottled water	7 (46.7)	3 (20.0)	1 (6.7)	3 (20.0)	0 (0.0)	0 (0.0)	1 (6.7)	15 (100.0)	
Tap water	6 (40.0)	1 (6.7)	1 (6.7)	6 (40.0)	1 (6.7)	0 (0.0)	0 (0.0)	15 (100.0)	
Borehole water	9 (32.1)	5 (17.9)	3 (10.7)	6 (21.4)	3 (10.7)	1 (3.6)	1 (3.6)	28 (100.0)	
Sachet water and bottled water	1 (33.3)	1 (33.3)	0 (0.0)	1 (33.3)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)	
Sachet water and borehole water	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)	2 (100.0)	
Source of disposal									
Water cistern	35 (31.8)	21 (19.1)	12 (10.9)	29 (26.4)	8 (7.3)	2 (1.8)	3 (2.7)	110 (100.0)	0.493
Open dumping	3 (27.3)	0 (0.0)	1 (9.1)	6 (54.5)	1 (9.1)	0 (0.0)	0 (0.0)	11 (100.0)	

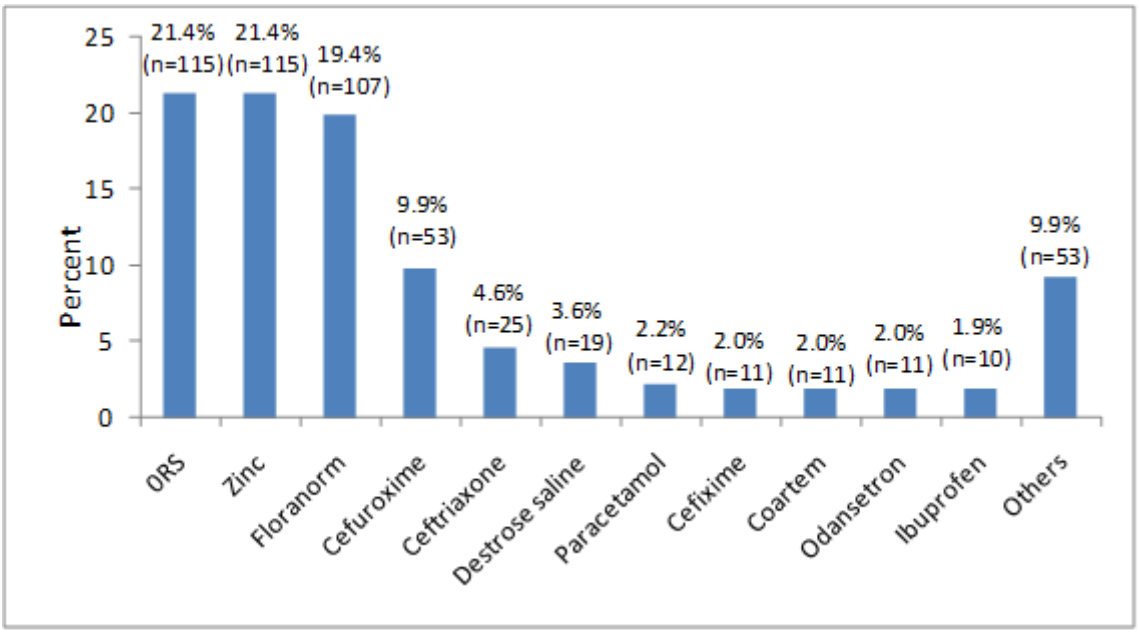

Figure 1: Profile of drugs prescribed.

indicate that adequate supplies of zinc and ORS are required and that public and private sector suppliers should be better informed about both of these resources.[23] The use of ORS and zinc in our study was very high which is very good for child survival strategies.

This study showed more (48.1%) patients were prescribed antibiotics. This is in contrast with other studies where antibiotics were more prescribed.[12,24] Antibiotic medication is used as a complement to shorten the length of the disease, eradicate the causative organisms, lessen transmission, and avoid invasive consequences, even though the majority of AGE cases in children under five years old are viral and thus require just supportive therapy. When deciding which antibiotic to take for acute bacterial gastroenteritis, the clinical diagnosis of the most probable cause should be considered before definitive test results.[8] And from the results laboratory investigation was not carried out in 62% of the patients, and stool test was not recommended in 77.7% of the patients. So, from the result, it can be said that antibiotics were inappropriately prescribed. It is also evident that parents and guardians of younger patients could seek or even expect antibiotic medication, which could put more pressure on the doctor to suggest an inappropriate course of treatment.[25]

This study showed a high usage of probiotics like floranorm. According to earlier studies, probiotics appear to be safe and have clear benefits in lowering the incidence and prolonging the course of acute infectious diarrhea.[26] Ondansetron was rarely used in this study as children presenting with AGE. This is consistent with the guidelines, which state that antiemetics are generally not considered necessary when treating vomiting in children caused by gastroenteritis.[27]

This study showed the association of age with acute gastroenteritis as children within 12- 24 months had the highest number of cases. Similar to earlier research conducted in Nigeria and India that demonstrated the prevalence of AGE in children under two years old,[28,29] this study differs from another one that indicated the 0-11 months age group to have the largest burden.[30] A substantial correlation between breastfeeding and diarrhea was observed. Studies have shown that breastfeeding can prevent diarrhea diseases in children under five years old.[31] It appears that the older babies were not adequately nursed because of their increased susceptibility. Most patients (94.2%) were fully immunized as per the National immunization schedule. This reflects a general awareness among the caregivers about immunization and a good functional immunization program for children by healthcare providers although this was not statistically associated with diagnosis ($p>0.05$). The source of drinking water was an associated factor of diagnosis of AGE, and a majority of the patients used sachet water as their source of drinking water, sachet water could easily be contaminated by the environment, and improper storage and handling by vendors also poses a serious threat to the health of the patients. Used of "bottled" water and "tap" water showed the lowest number of patients that presented with gastroenteritis. Water is also a major factor in children coming down with AGE, so parents should provide better sources of water for their infants. The study subjects were mostly urban dwellers and used the water cistern method of waste disposal.

CONCLUSION

Although the prescribers' practices fall below the WHO standard guidelines in the treatment of acute gastroenteritis in under 5 children, there were however certain good prescribing practices in this study; The high level of oral rehydration therapy

(ORT), zinc, floranorm in this study are appropriate with the standard guidelines. The overuse of antibiotics and high levels of polypharmacy in the treatment of acute gastritis should be discouraged. Good hygiene and nutritional practices are thereby recommended to children's caregivers. A more comprehensive study on promoting prescribing habits in hospitals is required.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

AGE: Acute Gastroenteritis; **WUO:** World Health Organization; **DUR:** Drug Utilisation Review; **ORS:** Oral Rehydration Solution; **UBTH:** University of Benin Teaching Hospital; **EDL:** Essential Drug List; **USA:** United States of America; **RUM:** Rational Use of Medicines; **ORT:** Oral Rehydration Therapy.

SUMMARY

There was a high level of polypharmacy recorded in this study. The prescribing habit of the healthcare givers falls within the recommended guidelines of use of anti-gastroenteritis, as oral rehydration therapy (ORT), zinc, and floranorm were highly used in the management of acute gastroenteritis. Good hygiene and breastfeeding practices were also observed in the study.

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