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Research Article



Assessment of Drug Treatment Practices and Pattern for Gastroenteritis Among Under-Five Children in A Tertiary Hospital in Southeast Nigeria

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ABSTRACT

Background: Inappropriate drug prescribing is common in clinical practice with a consequent significant negative economic and clinical burden. This study assessed the drug treatment practices for gastroenteritis among under-five children in a teaching hospital in southeast Nigeria.

Methods: A retrospective analysis of prescription records from June 2017 to June 2019, was conducted using the World Health Organization (WHO) recommended drug use indicators, adapted for children's healthcare. A total of 310 prescriptions were selected using systematic sampling. The number of drugs in each prescription, number of prescriptions, cost of the prescription were analyzed. The student's T-test was used to summarise the differences in means. $P < 0.05$ was considered significant.

Results: Most of the children were males 164 (52.4%). The total number of prescriptions ($n=310$), contained 1,327 drugs. The average number of drugs per prescription was 4.5 ± 1.12 with a mean cost of ₦ 3, 672.84. The prevalence of Acute Gastroenteritis (AGE) within the period of the study was 7.7 %. Each prescription contained an average of 4.5 ± 1.12 drugs, at a mean cost of N3, 672.84 (USD 1 equals N380). Zinc tablet (27.8%) was the most prescribed drug, followed by oral rehydration salt (ORS), (25.4%). The Index of Rational Drug Prescribing (IRDP) obtained from the study is 2.15. $P < 0.001$.

Conclusion: Most cases of AGE in children are viral and self-limiting, treated by rehydration with appropriate fluid-and-electrolyte replacement, and proper nutrition.

Keywords: drug utilization, pediatrics, gastroenteritis, prescribing practices, mortality, drug use evaluation

1. INTRODUCTION

The diverse drug utilization pattern and the increased cost incurred on drug therapy could put a severe burden on patients' treatment and in the management of gastroenteritis. These facts need to be assessed and awareness created among health care professionals to support and manage gastroenteritis following rational drug use patterns and WHO treatment guidelines. Monitoring the safety of medicine use in children is of paramount importance because only limited data was generated through clinical trials during the clinical development of medicines [1]

Use of medicines outside the specifications described in the license in terms of formulation, indications, contraindications or age constitutes off-label and off-license use and this is a major area of concern in the management of gastroenteritis in children below five years. Sequel to the recent reports on the inappropriate drug prescriptions common in clinical practice with implications for significant economic and clinical consequences, drug utilization review (DUR) became essential to assess drug use patterns in health facilities, to identify opportunities for remedial measures to enhance the achievement of therapeutic goals and patients' quality of life.[2]

Gastroenteritis results from an inflammation of the gastrointestinal tract commonly caused by viral pathogens and less frequently by bacterial or parasitic organisms.[3]Every year about 1.5 million children die from diarrhea resulting from gastroenteritis, mostly in developing countries; making diarrhea the second most common cause of death among children under the age of five following pneumonia.[3] Nigeria recorded one of the highest mortality rates in the world for children under the age of 5 according to the Global Burden of Disease estimate of 2015

(328 deaths per 100 000) with Nigeria and India accounting for 42% out of 499,000 deaths as a result of diarrhea in children under 5 years in 2015.[4] Acute gastroenteritis in children is the onset of diarrhea in the absence of chronic disease, with or without abdominal pain, fever, nausea, or vomiting. Although generally mild and self-limiting, it causes 1.5 million visits to primary care providers each year and 220,000 hospital admissions for children under the age of five. [5] The mortality risk for very-low-birth-weight infants (less than 1500 g) due to AGE is 100 times higher than for infants of low or appropriate birth weight (more than 1500 g). [6] From a global perspective, gastroenteritis in children is of enormous public health importance.

Dehydration is probably the main complication of gastroenteritis in childhood. Dehydration and electrolyte disturbances are complications of acute gastroenteritis. All moderate and severe patients require close monitoring, but patients at the extreme ages of life, especially children under 18 months, require meticulous observation and immediate medical attention in case their condition worsens. According to current WHO recommendations, oral rehydration therapy (ORT) is considered the treatment of choice to replace fluid and electrolyte losses caused by mild to moderate diarrhea in children. [7] Children presenting with AGE often have high levels of vomiting that can interfere with the oral rehydration process, limiting the success of the oral therapy. Ondansetron is widely used in the pediatric emergency department for vomiting. This has led to the successful delivery of ORT, thereby reducing the need to treat with IVT. [5]

Zinc is an important trace element, required by enzymes for activation and gene expression. [5] It is essential for epithelial barrier integrity, tissue repair, cell-mediated immunity, and immune function. Zinc is an antioxidant and anti-inflammatory agent effective in

gastrointestinal structure and function. Probiotics are food supplements that improve the intestinal microbial balance of the host. They have beneficial effects on health, prevent outbreaks of community-acquired diarrhea, reduce colonization of pathogenic microorganisms in infants, and reduce the duration and severity of diarrhea infections, balancing the intestinal ecosystem. [10,11] The physiological composition of intestinal microflora is essential to maintain an appropriate balance of microbiota and the intestinal barrier. The European Society for Pediatric Gastroenterology, Hepatology and Nutrition and the European Society of Pediatric Infectious Diseases guidelines recommended the use of probiotics for the management of acute gastroenteritis, particularly those with documented efficacy such as *Lactobacillus rhamnosus*, *Lactobacillus reuteri*, and *Saccharomyces boulardii*. [10]

The management of acute gastroenteritis has been based on the option of "doing the least" which includes: oral rehydration-solution administration, early re-feeding, no testing, no unnecessary drug. For developing countries where resources are limited, the costs of inappropriate drug prescription can be enormous in addition to the clinical risk consequences. It becomes necessary that regular auditing of prescriptions be carried out to ensure the rational and cost-effective use of drugs to increase efficacy, reduce side effects, and provide feedback for prescribers. This study, therefore, assessed the drug treatment practices and patterns for gastroenteritis among under-five children.

2. METHODS

2.1 Study Design

This study was a retrospective, cross-sectional survey carried out on under-five children who were diagnosed with gastroenteritis in the Enugu State University Teaching Hospital (ESUTH) Nigeria. A standard approach following WHO-recommended treatment guidelines was employed to investigate the pattern of drug

prescriptions at the health facility using core drug use indicators. The study was carried out between the periods of June 2017 to June 2019.

2.2 Sample Size calculation:

The sample size was calculated using formula by Yamane (1967):

$$N = \frac{N}{1 + N(e)^2} \quad (1)$$

Where n = unknown, N = Total number of population, e = margin of error.

Using the formula above, a sample size of 286 was obtained. Additional 24 prescriptions were added to obtain a sample size of 310 prescriptions. A systematic sampling technique was used to select the prescriptions. The inclusion criteria were medical records of under-five children receiving treatment for acute gastroenteritis. Medical records with incomplete and confusing information were excluded from the study.

2.3 Ethical Approval

Ethics approval for the study was obtained from the Ethics Committee of ESUTH. Patients' confidentiality was observed by eliminating their names from the prescriptions.

2.4 Data analysis:

The investigators checked the data on the sites each day for completeness and consistency.

Data entry and analysis were done using SPSS Version 21. The findings were summarized using descriptive statistics (mean, standard deviation) and percentages. The student's T-test was used to summarize the differences in means. $P < 0.05$ was considered significant.

3. RESULTS

There were predominantly more males than females in our study. The majority of drugs from our study were prescribed by generic names. This was good as it helped reduce the cost of the prescription. The number of antibiotics observed in our study

was 242(77.3 %), with an average number of prescriptions being 0.76 ± 0.09 . Table 1 showed a summary of the indicator used.

Table 1: Summary of indicator used

Indicator parameter	Result
The total number of prescriptions analyzed	310
The total number of drugs prescribed	1,537
No. of male patients n, (%)	164 (52.4%)
No. of females, n (%)	149 (47.6%)
Average age (in months) \pm SD (Standard Deviation)	11.73 \pm 8.30
The average number of prescriptions per day \pm SD	4.91 \pm 1.32
The average number of drugs per prescription \pm SD	4.5 \pm 1.12
Number (%) of antibiotics prescribed	242 (77.3 %)
An average number of antibiotics per prescription (Std. Dev.)	0.76 \pm 0.09
Number (%) of gastroenteritis drugs prescribed by generic names	532 (74.6%)
Number of drugs from Essential Drug List (EDL)	1521 (98.9 %)

3.1 Comparison of the prescription values of ESUTH prescribers

Table 2 showed that there was no significant difference in the average prescription and antibiotic prescription obtained from this study (P-values of 0.529 and 0.111). There was however significant difference in the prescriptions from the essential drug list (EDL). This value may have been affected by the small sample size of prescribers assessed.

Table 2: Comparison of prescription values of ESUTH prescribers

Variables	One-Sample Test Value = 4.86					
	T	df	P-value	Mean Difference	95% Interval Difference	
					Lower	Upper
Average prescription	-1.703	14	.111	-.367	-.83	.10
Average antibiotic prescription	.646	14	.529	.107	-.25	.46
An average prescription from EDL	-13.477	14	.000	-1.860	-2.16	-1.56

df: degree of freedom

3.2 Classes of drugs used in the treatment of acute gastroenteritis

The classes of drugs used in the treatment of gastroenteritis are shown in Table 3. Among the drugs used in the study area for AGE, ORS appeared to be most frequently prescribed (25.4 %) after Zinc.

Table 3: Classes of drugs used in the treatment of acute gastroenteritis

S/N	Prescribed Drugs	Class of Drugs	Out Patients files n (%)	ESUTH (Prescribers) n (%)
1	Zinc	Trace elements	266 (27.8)	15 (24.2)
2	ORS	Electrolyte	243 (25.4)	15 (24.2)
3	Floranorm (<i>S. boulardii</i>)	Probiotics	178 (18.6)	15 (24.2)
4	Linex (<i>B. infants</i> , <i>E. feacium</i> , <i>L. acidophilus</i>)	Probiotics	3 (0.3)	0 (0.0)
5	Ciprofloxacin	Fluoroquinolone	135 (14.1)	15 (24.2)
6	Cefixime	Cephalosporin	54 (5.6)	10 (16.1)
7	Azithromycin	Macrolides	23 (2.4)	4 (6.5)
8	Cefpodoxime	Cephalosporin	17 (1.8)	1 (1.6)
9	Ondansetron	Antiemetic	23 (2.4)	5 (8.1)
10	Clarithromycin	Macrolide	3 (0.3)	0 (0)
11	Amoxicillin+Clavulanic acid (Augmentin)	Penicillin	10 (1.0)	6 (9.7)

3.3 The Duration and frequency of drugs prescribed

The result from this study revealed the duration and frequency of prescribed drugs. The average prescription duration for zinc was 10 days with a dose frequency of once daily. Details of the analysis are shown in Table 4.

Table 4: Duration and frequency of drug prescribed

Indicators	n (%)	n (%)
1. Prescription duration	Floranorm	Zinc
2 days	-	2 (6)
3 days	194 (62.0)	-
4 days	36 (11.5)	-
5 days	70 (22.4)	3 (1.0)
7 days	10 (3.2)	52 (16.6)
10 days	3 (1.0)	107 (34.5)
14 days	-	148 (47.3)
2. Dose frequency		
Once daily	224 (71.6)	303 (96.8)
Twice daily	87 (27.8)	10 (3.2)
Three times daily	2 (0.6)	-

3.4 Prescription cost indicators

The costs of prescriptions within the study period from our findings showed that the total cost of drugs incurred in the prescriptions was N1, 149, 600 with the cost of each prescription ranging from N650 to N7, 850. About (72.3 %), of the prescriptions cost between N1, 000 to N5, 000 while about (8.3%) of prescriptions cost less than N1, 000. References were made for the retail prices of the drugs at the community pharmacy outlets. The cost is expressed in Nigerian Naira (N). Details of the prescription cost indicators are shown in Table 5.

Table 5: Prescription cost indicators

S/N	Cost indicators	Value
1	The total cost of prescriptions	N1,149,600
2	The average cost of prescriptions per day	N3,672.84
3	Number of prescriptions (< N 1000)	26 (8.3 %)
4	Number of prescriptions (N1000 – N 5000)	226 (72.3 %)
5	Number of prescriptions (> N 5000)	61 (19.5 %)

3.5 WHO prescribing indicators for IRDP determination

Using the WHO prescribing indicators for IRDP determination, the results from this study showed that antibiotic prescribing; polypharmacy and injection prescribing had the lowest indices of 0.39, 0.03, and 0.00, respectively. The value of IRDP obtained from this study was 2.15. The detailed result is shown in Table 6.

Table 6: WHO prescribing indicators for IRDP determination

WHO prescribing indicators	Optimal level (%)	Optimal index	IRDP
Non-polypharmacy prescription	≤ 3	1	0.03
Drug prescription by generic names	100	1	0.75
Prescription with antibiotics	≤ 30	1	0.39
Prescription with injections	≤10	1	0.00
Drug prescribed from EDL	100	1	0.98

EDL = Essential Drug List, IRDP = Index of Rational Drug Prescribing

4. DISCUSSION

This study assessed drug treatment patterns of gastroenteritis among under-five children at Enugu State University Teaching Hospital, Enugu, Nigeria. The study was a retrospective survey on 310 prescriptions selected by systematic sampling.

This study revealed the prevalence of acute gastroenteritis (AGE) in 12-month-old children. This is consistent with a study [11] which showed the prevalence of AGE in children below 2 years of age with the highest prevalence in infants. Another study.[12] discovered that most of the children with AGE were under 2 years of age and those 6-12 months were predominantly

affected. [13-15, 11, 12]. The incidence of AGE among children under the age of five years in this study was probably due to a lack of immunity against common enteral infectious pathogens. The protective effect of breast milk could also play a role in the number of infants below the age of 6 months with AGE. This was because there was less prevalence of AGE among this group as shown in the study. The older infants were more affected and this could be due to factors such as the feeding practices adopted for them. Weaning usually commences at 6 months and this could expose the children to pathogens. [14, 16-18]. Poor sanitation has also been implicated as a major risk factor in

the incidence of AGE. Our study subjects were mostly urban dwellers and use the water cistern method of waste disposal. The inefficient water supply could lead to increased incidence of fecal-oral transmission of AGE pathogens. The most common symptoms of AGE presented by children under the age of 5 years included fever and vomiting, which could be interpreted to mean the possibility of infectious acute gastroenteritis. Although this study did not seek out those children with infectious AGE, the association of fever could be viewed to be due to infectious pathogens. These infections can affect the digestive system primarily and thus result in diarrhea. [19-23]

This study showed that ORS was prescribed in every case of AGE documented. This was in line with the current WHO recommendations. Oral rehydration therapy (ORT) is considered the treatment of choice to replace fluid and electrolyte losses caused by diarrhea in children with mild to moderate dehydration. The use of ORS in our study was very high despite the vomiting documented as comorbidity. This indicated that many now practice the use of ORS as one of the child survival strategies. Clinical practice guidelines for the treatment of children with gastroenteritis recommended supportive care using ORT for mild-to-moderate dehydration but provided no recommendation on the additional use of antiemetic medication for vomiting. [24-26,11,12,27]

Ondansetron was widely used in the pediatric emergency department in this study for vomiting and AGE. Children presenting with AGE often have high levels of vomiting that can interfere with the oral rehydration process, which could limit the success of oral therapy. [28] A similar study in Italy revealed that almost all secondary and primary care physicians were willing to prescribe ondansetron to children for this indication. A systematic review provided evidence that supports the use of ondansetron as an adjunct to standard ORT in the treatment of children with AGE exhibiting mild-to-moderate dehydration. Ondansetron given to

children with mild-to-moderate dehydration appears to decrease the number of children who have persistent vomiting as a barrier to ORT. [29]

This study demonstrated the use of zinc in reducing the duration and severity of diarrhea in children. Diarrhea is associated with significant zinc loss. Zinc an important trace element is essential for epithelial barrier integrity, tissue repair, cell-mediated immunity, and immune function. It is effective in gastrointestinal structure and function. [30]

This study showed that there was approximately one antibiotic in every prescription assessed for under-five children. Although most cases of AGE in children are viral thus self-limiting and need only supportive treatment, antibacterial therapy serves as an adjunct, to shorten the clinical course and eradicate causative organisms, reduce transmission, and prevent invasive complications. The selection of antibacterial to use in acute bacterial gastroenteritis should be based on clinical diagnosis of the likely pathogen before definitive laboratory results. Antibacterial therapy should be restricted to specific bacterial pathogens and disease presentations. In general, infections with *Shigella* spp and *Vibrio cholera* should be treated with antibacterials while antibacterials are only used in severe unresponsive infections with *Salmonella*, *Yersinia*, *Aeromonas*, *Campylobacter*, *Plesiomonas* spp, and *Clostridium difficile*. [5, 31]

The reason for the high frequency of ciprofloxacin in our study could be attributed to cases of bloody diarrhea in the study area. According to a recent Cochrane review, the authors did not find robust evidence to suggest that antibiotics of a particular class are better than those belonging to a different class. [5] Trials reported that at various periods, different antibiotics such as ampicillin, cotrimoxazole, nalidixic acid, fluoroquinolones, pivmecillinam, ceftriaxone, and azithromycin have been effective against isolates of *Shigella* dysentery in different parts of the world. Limited data however

from a subgroup of studies suggested that fluoroquinolone (ciprofloxacin) would be more effective than beta-lactam (ampicillin) in reducing diarrhea among adults, while beta-lactams would be more effective than fluoroquinolones in reducing diarrhea among children with proven *Shigella* dysentery. [5]

This study showed the use of probiotics like floranorm and linex. The rationale could be attributed to the physiological composition of the intestinal microflora which is essential in maintaining an appropriate balance of microbiota and the intestinal barrier. The European Society of Gastroenterology, Hepatology, and Nutrition and the National Institute for Health and Clinical Excellence had suggested the use of probiotic strains with proven efficacy and in appropriate doses for the management of children with acute gastroenteritis as an adjunct to rehydration therapy. [32]

The IRDP value obtained from this study was low compared to the WHO reference standard of 5. This is consistent with the result obtained from a study [33] in Northern Nigeria that also reported a low value of IRDP

CONCLUSION

This study revealed that the tertiary hospital in southeastern Nigeria observed the WHO standard guidelines in the treatment of acute gastroenteritis (AGE) in children under five years. AGE remains a major problem in children and still represents one of the leading causes of illness costs and of deaths. Most cases of acute gastroenteritis in children were viral and self-limiting and required only rehydration with oral or intravenous therapy. A more comprehensive study in promoting prescribing habits in hospitals is required in hospitals. [5]

Limitations of the study

The study mainly analyzed prescription records of dispensed drugs in the hospital but did not capture the prescriptions obtained outside the hospital pharmacy due to out-of-stock drugs stock drugs hence our analysis may not have fully reflected the actual prescriptions generated

in the hospital for children under-five years. The records at the hospital were manually kept and the study encountered challenges associated with documentation and retrieval of relevant data to inform the adequate analysis.

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REFERENCES

1. WHO 2007. Promoting Safety of Medicines for Children. Accessed online at <https://apps.who.int/iris/handle/10665/43697> Accessed on 2 January, 2020.
2. Ezenduka CC., Ogbonna BO, Ubochi C. "The Utilization Pattern and Costs Analysis of Psychotropic Drugs at a Neuropsychiatric Hospital in Nigeria," *Br. J. Pharm. Res.* 2014; 4; 3: 325–337.
3. brahim MLC, Ahmed I et al., "Reduction of hospitalizations with diarrhea among children aged 0–5 years in Nouakchott, Mauritania, following the introduction of rotavirus vaccine," *Vaccine*, 2019; 37(11):1407–1411.
4. Arowolo KO, Ayolabi CO, Lapinski B, Santos JS, Raboni SM (2019). Epidemiology of the enteric viruses in children with gastroenteritis in Ogun state, Nigeria. *Journal of medical virology*. 91(6): 1033
5. Caramia G, Ciccarelli S, Stolfi I, Giuseppe C. "Management strategies in the treatment of neonatal and pediatric gastroenteritis," *Infection and Drug Resistance*. 2013; (6):133-161.

6. Carter B, Carter BR, Fedorowicz Z. "Antiemetic treatment for acute gastroenteritis in children: An updated Cochrane systematic," *BMJ Open*. 2012; 2:e000622.
7. Bruzzese E, Giannattasio A, Guarino A, "Antibiotic treatment of acute gastroenteritis in children," *F1000Research*. 2018; (7):193
8. Alameddine A, Mourad S, Rifai N, "Management of acute gastroenteritis in healthy children in Lebanon - A national survey," *N. Am J of Med Sci*. 2010; 2(11):512–517.
9. Grenov B et al., "Diarrhea, Dehydration, and the Associated Mortality in Children with Complicated Severe Acute Malnutrition: A Prospective Cohort Study. *Uganda*," *J. Pediatr.*, 2019. 210(3): 26-33.
10. Whyte LA, Al-Araji RA, McLoughlin LM, "Guidelines for the management of acute gastroenteritis in children in Europe," *Arch. Dis. Child. Educ. Pract. Ed.*, 2015;100(6):308–312.
11. Ezeonwu B, Ibeneme C, Aneke F, Oguonu T, "Clinical features of acute gastroenteritis in children at University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu," *Annals of Med and Health Sci Res*.2013;3(3):361.
12. Kazemi A, Tabatabaie F, Agha-Ghazvini FMR, Kelishadi R, "The role of rotavirus in acute pediatric diarrhea in Isfahan, Iran," *Pakistan J of Med Sci*.2006; 22(3):282–285.
13. Liévin-Le Moal V, "Dysfunctions at human intestinal barrier by water-borne protozoan parasites: Lessons from cultured human fully differentiated colon cancer cell lines," *Cell. Microbiol.*, 2013;15(6):860–869.
14. García VC et al., "Acute bacterial gastroenteritis: 729 cases recruited by a Primary Care national network," *An. Pediatr.*, 2017;87(3):128–134.
15. Yang JC, Lu CW, Lin CJ, "Treatment of Helicobacter pylori infection: Current status and future concepts," *Wld J Gastroenterol*, 2012; 20(18):5283–5293.
16. Humphries RM, Linscott AJ., "Laboratory diagnosis of bacterial gastroenteritis," *Clinical Microbiol Rev*.2015; 28(1):3–31.
17. Getachew A, Alebachew T, Mulat GH, et al., "Environmental factors of diarrhea prevalence among under five children in rural area of North Gondar zone, Ethiopia," *Italian J of Ped*.2018; 44(1):95.
18. Castaño A, Maurer MS, "Pathophysiology, Evaluation, and Management of Chronic Watery Diarrhea" *J Gastroentrol* 2015;20(2):163–178.
19. Peter AK, Umar U, "Combating diarrhoea in Nigeria: the way forward," *Journal of Microbiol & Experim*. 2018;6(4):1–10.
20. Howidi M, Al Jabi N. El Khoury AC, Brandtmuller ANagy L, Richer E et al., "Burden of acute gastroenteritis among children younger than 5 years of age - a survey among parents in the United Arab Emirates," *BMC Ped*.2012;12, 74.
21. Thakor D, Desai C, Kapadia J, Dikshit R, Mehariya K, "Efficacy and Safety of Deferasirox in Pediatric Patients of Thalassemia at a Tertiary Care Teaching Hospital," *Indian J of Med and Paed Oncol*.2017; vol. 38, no. 2. pp. 103–110.
22. Oyetunde O, Williams V. "Community pharmacists' views of the use of oral rehydration salt in Nigeria," *Int. J. Clin. Pharm.*, 2018; 40(3):3,659–667.
23. World Health Organization, "WHO | The environment and health for children and their mothers," WHO. 2016.
24. Kumar BS, Maria S, Shejila SCH, Udaykumar P, "Drug utilization review and cost analysis of anticancer drugs used in a tertiary care

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- teaching hospital," *Indian J of Pharm Sci.* 2018; 80(4):686–693.
25. Vasta Vet al., "Effect of the dietary supplementation of essential oils from rosemary and artemisia on muscle fatty acids and volatile compound profiles in Barbarine lambs," *Meat Sci.*, 2013; 95; 2: 235–241.
26. Cole C, James P, Kargbo A, "An evaluation of the prescribing patterns for under-five patients at a Tertiary Paediatric Hospital in Sierra Leone," *J. Basic Clin. Pharm.*, 2015; 6(4):109.
27. Ogbo PU, Aina BA, Aderemi-Williams RI, "Management of acute diarrhea in children by community pharmacists in Lagos, Nigeria," *Pharm Practic. (Internet)*, 2014;12(1): 01–06
28. UK General Medical Council, "Good Practice in Prescribing Medicines," *Gen. Med. Council.*, no. March, pp. 1–11, 2013.
29. Murray M, Versteeg M, Hugo J. "The impact of diarrhoea in infants on the quality of life of low-income households," *South African Fam. Pract.*, 2014;50, 2: 62-62c.
30. Abbas J, Chandra D, Pandey, A. Verma A, Kumar V, "Management of acute diarrhea in children: is the treatment guidelines is really implemented?," *Int. J. Res. Med. Sci.*, 2018; 6(2):539, 2018.
31. Phavichitr N. Catto-Smith AG, "Acute gastroenteritis in children: What role for antibacterials?," *Pediatr. Drugs*, 2003; 5(5): 279–2902006
32. Guarino A et al., "European Society for Paediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: executive summary," *J. Pediatr. Gastroenterol. Nutr.*, 2008; (46):619–621.
33. Umar L, Isah A, Musa S, Umar B, "Prescribing pattern and antibiotic use for hospitalized children in a Northern Nigerian Teaching Hospital," *Ann of Afric Med.* 2018;17(1):26.

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