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The Use of Antibiotics in the Empirical Treatment of Acute Childhood Gastroenteritis in a Tertiary Hospital

Short Communication

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Abstract

Back ground: The routine empirical use of antibiotics for infectious diarrhea in children in developing countries is associated with the risk of increasing antibiotics resistance. This work studied the use of antibiotics in the empirical treatment of acute childhood gastroenteritis. **Methodology:** The medical folders of children diagnosed with acute gastroenteritis and hospitalized at the pediatric ward of St Patrick's Hospital, Mile 4, Abakaliki, Ebonyi State, Nigeria were used to collect the antibiotics treatment regime and socio-demographic data of each child. **Results:** The result showed that most of the children were treated without antibiotics, 27% [13] out of the 48 medical folders examined. Ceftriaxone was seen as the most singly used antibiotics at 17% [8], followed by ciprofloxacin at 15% [7]. Male children were recorded to be more affected by gastroenteritis 68.8% [33] than the females 31.3% [15]. **Conclusion:** The widespread use of beta-lactam antibiotics in the empirical treatment of childhood gastroenteritis may lead to the emergence of extended spectrum beta lactamase (ESBL) producing pathogens.

Keywords: Acute ,Antibiotics , Childhood,Empirical-treatment, Gastroenteritis

1. Introduction

Gastroenteritis is an inflammation of the lining of the intestine caused by a virus, bacteria or parasites. It causes watery diarrhea, pain or abdominal cramp, nausea, vomiting and sometimes fever (Hartman *et al.*, 2019). Worldwide, about 3-5 billion cases of acute gastroenteritis occur yearly with nearly 2 million deaths in children below 5 years. This makes diarrhea disease the fifth leading cause of death in children, and the eighth leading cause of death among all ages (Troeger *et al*., 2018). Nigeria is one of the two countries accounting for 42% of global deaths attributable to gastroenteritis in children less than five years (Arowolo *et al*., 2019). Due to the high mortality rate of gastroenteritis in children, treatment decisions are mostly made on clinical

outcome, while the choice of antimicrobial drugs is empirically made, based on narrow drugs that cover most of the possible pathogens (Diniz-Santos *et al*., 2016). The necessity for this empirical treatment method is because, the cost-effective means of identifying these pathogens involve conventional stool culture and antimicrobial susceptibility testing of isolated organisms which usually takes not less than 72 hours. The use of ciprofloxacin (fluoroquinolone) was recommended by WHO, as the first-line drugs in the treatment of bloody diarrhea (WHO, 2005). Empirically, cephalosporins, especially, cefixime and ceftriaxone are considered the best treatment for acute childhood gastroenteritis (Lieberman, 2003). However, reports have confirmed that ciprofloxacins are equally safe to be used in pediatrics, with some restrictions, like in severe cases (Bruzzese *et al*., 2018).

Unless in severe and in bloody diarrhea cases, antibiotics are not prescribed in the treatment of acute childhood diarrhea disease (Qureshi *et al*., 2021). Routine use of antibiotics for infectious diarrhea in children is associated with the risk of increasing antibiotics resistance in developing countries (Diniz-Santos *et al*., 2016; Ayukekbong *et al*., 2017; Britto *et al*., 2018). Without considerations to the WHO guidelines, ciprofloxacin (fluoroquinolone) and cephalosporins (ceftriaxone and cefepime) have been observed to be routinely used by physicians in the treatment of this disease in children in Nigeria (11-13)(Ekwochi *et al*., 2013;Efunshile *et al*., 2019;David *et al*., 2021). Unlike in developed nations, intravenous re-hydrations are commonly used (Burstein *et al*., 2022; Stanyevic *et al*., 2022; Weghorst *et al*., 2022). This indiscriminate use of antibiotics has resulted in the emergence of both multi-drug and cephalosporins (extended spectrum beta-lactamase, ESBL) resistant enteric pathogens (Wallace *et al*., 2020). Center for Disease Control has categorized ESBL-producing *enterobacteriaceae* as an "urgent threat" (CDC, 2019). This work studied the use of antibiotics in the empirical treatment of acute childhood gastroenteritis in Mile 4 Hospital, Abakaliki, Nigeria.

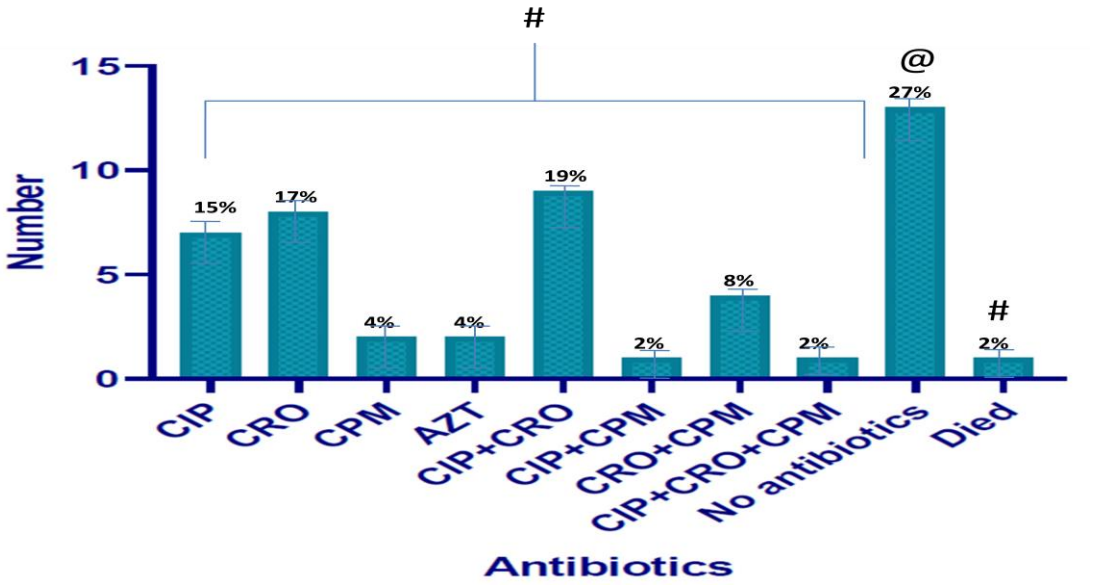
2. Methodology

The study recruited medical folders of 48 children between the ages of 0-5 years who were diagnosed with gastroenteritis from January to March, 2020. These months covered the window period for the yearly outbreak of gastroenteritis in Abakaliki, Ebonyi State, Nigeria. The stools were collected from the pediatrics unit of the hospital. Ethical clearance (Ref.No: RE/M4H/48/19) was obtained from Ethical and Research Committee of the hospital, after which informed consent was obtained from the parents/guardians/attendants of the children. Socio-demographic characteristics like age, gender, living area, clinical symptoms, co-morbidity were collected for each child. Trends in the use of antibiotics, such as types of antibiotics and their overall effectiveness were also collected for each child.

3. Results

The pattern of empirical treatment of children with acute gastroenteritis in Mile 4 Hospital is shown in figure 1. A greater percentage of the children was treated without antibiotics, 13 [27%]. Ceftriaxone was seen as the most singly used antibiotics at 8 [17%], followed by ciprofloxacin at 7 [15%]. Cefepime and azithromycin represented the least used single antibiotics at 2 [4%] each.

The most common double combination of antibiotics was the use of ciprofloxacin and ceftriaxone, 9 [19%], followed by ceftriaxone and cefepime at 4 [8%]. Triple combination of the use of ciprofloxacin, ceftriaxone and cefepime was 1 [2%],which was also the same with the double use of ciprofloxacin and cefepime.



[#]significantly different when compared to the No Antibiotics group[@]
CIP=Ciprofloxacin; CRO=Ceftriaxone; CPM=Cefepime; AZT=Azithromycin
Figure 1: Antibiotics used in empirical treatment of childhood gastroenteritis (*n*=48)

Table 1 shows the gender, age and treatment duration of children with acute gastroenteritis. The mean age of the children was 10.5 months [10.5±7.2]. Male children were recorded to be more affected by gastroenteritis 33 [68.8%] than the females 15 [31.3%]. The mean number of days spent at the hospital was 105 hrs [4.9±1.8]. Children treated with antibiotics were observed to spend higher number of days, 5.4±1.7 at the hospital than those not treated with antibiotics 3.5±1.5.

Table 1: Gender, age and treatment duration (*n*=48)

Male	Female	Mean age (mo)	Hospital duration (hr)		
			Mean	Antibiotics	No antibiotics
33 [68.8%]	15 [31.3%]	10.5±7.2	105±1.8	124±1.7[b]	77±1.5[c]

Signficantly higher than c (p=0.0005).

4. Discussions

This study revealed that a greater percentage [27%] of the children was treated without antibiotics, while ceftriaxone was seen as the most singly used antibiotics at 17%, followed by ciprofloxacin at 15%. Male children were recorded to be more affected by gastroenteritis [68.8%] than the females [31.3%]. In this health facility, while higher number of children was treated without antibiotics, the guidelines established by WHO on the use of antibiotics were not fully followed. Ciprofloxacin (fluoroquinolone) was only recommended by WHO as the first-line drugs in the treatment of bloody diarrhea (WHO, 2005). The high mortality rate of gastroenteritis in children has led to treatment decisions mostly made on clinical outcome, hence, empirical treatments with antimicrobial drugs are based on narrow drugs that cover most of the possible pathogens (Diniz-Santos *et al*., 2016).While the hospital rightly use cefixime and ceftriaxone which are considered the best treatment of acute childhood gastroenteritis (Lieberman, 2003), they equally used cefepime, a fourth generation cephalosporin which was not recommended. Routine use of antibiotics for infectious diarrhea in children is associated with the risk of increasing antibiotics resistance in developing countries (Diniz-Santos *et al*., 2016). In a multi-stage random sampling study involving different health facilities in Rivers State, Nigeria, antibiotics were prescribed in 78.6% of the children with acute gastroenteritis. Unlike our result, metronidazole was prescribed in 50.9% of the cases, while ceftriaxone was used in 0.2% (Ayukekbong *et al*., 2017). In another tertiary institution in Abakaliki Nigeria and Accra Ghana, 88.9% and 95% of the children were treated with antibiotics respectively (Ekwochi *et al*., 2013). In an observational study of 210 children with acute gastroenteritis in Enugu, Nigeria, the use of antibiotics was observed to start from the caregivers, even before hospital admission, where 46.7% of the children were given un-prescribed antibiotics (Efunshile *et al*., 2019).

Conclusion

The most used of ceftriaxone, a beta-lactam antibiotic in the empirical treatment of childhood gastroenteritis in this hospital facility may lead to the emergence of extended spectrum beta lactamase (ESBL) producing pathogens. Beta-lactamases break down beta lactam drugs and confer the ability to resist these drugs to pathogens.

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Ethical issues

The present research work was permitted by the Ebonyi State Universiy,University Human Ethical Committee and Ethical and Research Committee of Alex, Ekwueme Federal Teaching Hospital, Abakaliki. Nigeria

Conflict of interests

No conflict of interests are declared by authors.

Author's contributions

Conceptualization and design of the work : David, E.E., Igwenyi, I.O .; data acquisition, David, E.E., Eghosa, L. E,, David,C.N[3].; analysis and interpretation of data,David, E.E., Ezeilo, U. R ., original draft preparation :David, E.E.; manuscript review and editing: David, E.E, Ogbanshi, M. E; supervision: Igwenyi, I.E., Iroha, I.R; funding acquisition: David, E.E. All authors read and agreed to the version to be published and to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.