PREVALENCE AND PATTERNS OF ACUTE WATERY DIARRHOEAL ADMISSIONS PRESENTING TO A TERTIARY HOSPITAL IN SOUTH-EAST, NIGERIA.

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Abstract

Background: Globally, acute watery diarrhea (AWD) is a major cause of childhood morbidity and mortality. It is the fourth leading cause of death in children contributing as high as 11% of all childhood deaths. In Nigeria, AWD causes 240,106 under five deaths per year despite the interventions aimed at preventing diarrhoea disease.

Objective: This work was to determine the prevalence and patterns of acute watery diarrhoeal admissions among children presenting to Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra state, Nigeria.

Methods and Materials: This was an observational study. Children aged 6-36 months, admitted for acute watery diarrhea, who met inclusion criteria and whose caregivers gave informed consent. The caregivers of these children were interviewed using interviewer-administered questionnaire. Information obtained included socio-demography (age, gender, social class among others), symptoms of diarrhoea, duration of illness and medications given to these children at home. Data were analyzed using SPSS 21.

Results: Of the 159 study participants admitted for AWD, 103(65.0%) were males. Those of lower socio-economic class comprised 66.6%(106) while 49(30.6%) and 4(2.8%) belonged to the middle and upper socio-economic classes respectively. A total of 921 inpatients were admitted for the period of the study (January 2017 to October 2017), giving an AWD prevalence of 17.3%(159).

The highest number of admissions occurred from January to March 2017, with highest prevalence in March. There is poor utilization of oral rehydration solution (40.3%; 64) with abuse of antibiotics in the home management of diarrhea.

Conclusion and recommendations: The result of this study showed that the prevalence of AWD is still unacceptably high. Interventions aimed at prevention (such as promotion of exclusive breastfeeding, health education on hand and environmental hygiene, and inclusion of rota virus and cholera vaccine in our national program on immunisation etc) should be encouraged and strengthened by the policy makers and monitored for proper uptake by the populace.

Key words: Prevalence, Acute watery diarrhoea, children, Admissions

Introduction

Diarrhoeal diseases are among the most common illnesses afflicting children in both developing and developed countries.^{1,2} Approximately 1.7 billion cases of diarrhoeal diseases occur annually worldwide.³ Diarrhoeal diseases account for 11% of all under five deaths worldwide and claims the lives of 1.8 million children per year.³ Acute watery diarrhoea is among the top leading causes of under-fives death globally⁴ and the third leading cause of infant and childhood mortality in developing countries.⁴⁻⁶ Acute watery diarrhoea is responsible for 240,106 deaths annually in Nigeria.^{4,6,7} Progress has been made in the reduction of this high infant and childhood mortality due to diarrhoea from 4.6 million to 1.8 million over the last three decades.⁸⁻¹² Despite this progress, the prevalence of acute watery diarrhea and the number of diarrhoeal deaths remain unacceptably high.

Diarrhoea as defined by World Health Organization is the passage of three or more loose stool in a twenty-four-hour

period, a loose stool being one that would take the shape of a container.¹³ The infectious agents that cause diarrhoea are usually spread by faeco-oral route.^{14,15} This includes ingestion of contaminated water or food, person-to-person transmission and direct contact with infected faeces.

Most diarrhoeal episodes occur during the first two years of life. Incidence is highest in the age group 6-11 months when complementary diet is often added.¹⁴ This pattern reflects the combined effects of declining levels of maternally-acquired antibodies, the lack of active immunity in the infant, the introduction of food that may be contaminated with faecal microbes and direct contact with human or animal faeces when the infant starts to crawl.¹⁵ Distinct seasonal patterns of diarrhoea occur in many geographical areas. In tropical areas, rotavirus diarrhoea tends to occur throughout the year, increasing in frequency during the drier, cool months, this was demonstrated by Tagbo *et al*¹⁶ in Enugu and Ogbu *et al*¹⁷ in Ebonyi whereas bacterial diarrhoeas tend to peak during the rainy season. In temperate climates, bacterial diarrhoeas tend to occur more frequently

during the warm season, whereas viral diarrhoeas peak during the winter^{15,18} Anyorikeya¹⁸ in Ghana reported the peak diarrhoea season to be in the rainy season from May to August. Ahmed *et al.*¹⁹ recorded an acute watery diarrhoea prevalence of 25.2% with a declining prevalence in summer months in the temperate regions. Most diarrhoeal deaths are preventable with health education on hygiene and proper sanitation, early identification and presentation to a health facility, administration of oral Zinc and the use of inexpensive, properly constituted oral rehydration solution (ORS).²⁰ Considering differing prevalences and seasonal variations with reference to diarrhoeal diseases, and that no such study has been done in our environment, it is important to determine the prevalence and pattern of diarrhoeal admissions in Nnamdi Azikiwe University, Teaching Hospital (NAUTH), Nnewi, Anambra State.

Methods and Materials

Study design: This was an observational study that recorded all admissions that occurred from January to October 2017. The total number of admissions, the diagnoses that were made and the ones that had acute watery diarrhoea were checked. These data were assessed and compared in all the months studied.

Study area: The study was conducted at the Children's Emergency Room (CHER) and Paediatric Medical Ward (PMW) of Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State, South-East, Nigeria. NAUTH offers primary, secondary and tertiary level health care services to all varieties of patients and draws clientele from the entire state. Nnewi-host town of NAUTH is the second largest town in Anambra state. It falls within the tropical rainforest region of Nigeria. It is located on latitude 6°1'N and longitude 6° 55'E of the Niger River and 22km South East of Onitsha.²¹ Majority of the populace source their water privately from water vendors, bore-holes, rainwater and stream water. There are lots of schools catering for children of all ages including infants.

Ethics approval for the study was obtained from the Research and Ethics Committee of Nnamdi Azikiwe University Teaching Hospital, Nnewi (NAUTH/CS/66/vol.11/139/2018/098). The concept of the study was carefully explained to the respondents and written informed consent obtained prior to the completion of the questionnaires. Participation in this study was voluntary, such that the refusal of any caregiver to participate in the study did not affect the management of his/her child or ward. Confidentiality of the information obtained was assured by coding of data collection instrument and respondents were free to opt out of the study at any desired stage, without adverse consequences to them from the study team but none did.

Study population:

All children who were admitted for acute watery diarrhoea (for the purpose of the study, passage of loose or watery stool lasting less than 2 weeks). The subjects who met the inclusion criteria were recruited through consecutive enrollment. The following children were excluded from the study: Human immunodeficiency virus (HIV) positive children, children with diarrhoea disease lasting more than two weeks, children that acquired diarrhoea in the course of admission for treatment of other diseases and children with visible blood in stool.

Data Collection:

Information was obtained using pretested interviewer administered questionnaire from the caregivers of these children. Data obtained included, age, gender, maternal age, education and occupation and other socio-demographic characteristics, and medications given to these children at home before presenting to our facility.

Results

In the period of the study (January 2017 to October 2017), a total of 921 inpatients (538 males and 383 females, in the ratio of 1.4:1) were seen in the hospital of which 159 patients had acute watery diarrhoea, giving a prevalence of 17.3%. Among the patients that had acute watery diarrhea, 103.0 (65%) were males while 56 (35%) were females giving a ratio of 1:0.4.

The highest number of admissions occurred from January to March 2017, with highest prevalence in March, (see figure 1).

Socio-economic characteristics:

Mothers constituted 93.1% (149) of the informants, while grandmothers, fathers, other relatives and others

(neighbours, friends), constituted 2.7% (4), 1.4% (2), 1.4% (2) and 1.4% (2) respectively of the informants. The maternal ages ranged from 21 years to 46 years.

Mothers' educational level and occupation:

Up to 38.9% (62) of the mothers had tertiary education, followed by secondary education 33.3% (53), 10.6% (17) had primary education while 10% (16) of the mothers had NCE, other forms of formal education was reported in 7.2% (11) of the mothers. Trading (31.9% [51]) and civil service (29.2% [46]) contributed to maternal occupation. Up to 23.6% (38) of the mothers were unemployed, 11.1% (18) were skilled workers, and 2.8% (4) were students while only 1.4% (2) of the mothers were professionals.

Fathers' educational level and occupation:

Fifty-six point nine percent (91) of the fathers had secondary education, 22.2% (35) had primary education while 11.6% (18) and 9.3% (15) had tertiary education and other forms of formal education as their highest educational level respectively. Trading contributed to as much as 55.7% (89) of the fathers' occupation, 30 % (48) were artisans/skilled workers, civil service constituted 10% (16) of the fathers' occupation while 2.9% (5) and 1.4% (2) were unemployed and professionals respectively.

Socio-economic class:

One hundred and six (66.6%) of the study participants belonged to the lower social class, 49(30.6%) were of the middle socio-economic class and 4(2.8%) were classified under high socio-economic class (see table 1).

Table 1: Socio-demographic characteristics of the study participants

CHARACTERISTICS	FREQUENCY (%)
	N =159
Gender	
Males	103(65.0)
Females	56(35.0)
Total	159(100.0)
Age group	
6-11 months	80 (50)
12-23 months	68 (43.1)
24-36 months	11 (6.9)
Total	159 (100.0)
Socio-economic class	
Upper class	4 (2.8)
Middle class	49 (30.6)
Lower class	106 (66.6)
Total	159 (100.0)

Class of medications given to the patients at home:

The medications given to these children and the frequency of administration as depicted in Table 2, included Paracetamol (92;58.3%), Metronidazole (73;45.8%), ORS (64;40.3%), other antibiotics (42;26.4%), intramuscular medications (39 ;25.0%), anti-malaria agents (31 ;19.4%), anti-diarrhoeal drugs (13;8.3%), herbal mixture (13;8.3%), Vitamin C (11;6.9%) and Probiotics (6;4.2%). Most of these medications were given in combination with other

medications. The number of medications given to these children is grouped and presented in Figure 2.

Table 2: Class of medications given to the patients at home before presenting to health facility

CLASS OF MEDICATIONS	FREQUENCY (%)
Paracetamol	92 (58.3)
Metronidazole	73 (45.8)
ORS	64 (40.3)
Other antibiotics	42 (26.4)
Intramuscular medications	40 (25.0)
Anti-malaria	31 (19.4)
Unknown	28 (18.1)
Anti-diarrhoeal agents	13 (8.3)
Herbal Mixture	13 (8.3)
Vitamin C	11 (6.9)
Probiotics	6 (4.2)
Anti-helminthic	4 (2.8)

- Some of the patients received more than one class of medications.

Figure 2: Frequency distribution of the number of medications received per study participant

Discussion

The prevalence rate of 17.3% for acute watery diarrhoea reported by this study demonstrates the burden of acute watery diarrhoea in our sub-region. Other studies²²⁻²⁴ reported higher prevalence rates. Nwaoha *et al*²² reported prevalence of 22.5% and 24.5% in their two study areas. Though these two values were almost similar, the relative difference was attributed to one study area being located in a rural area (24.5%) and the other study area with a lower prevalence (22.5%) being located in an urban area. Omelonye *et al*²³ recorded a prevalence of 24.2% in the age group of 5 to 10 years. The relatively lower prevalence rate reported by this study when compared to other studies could be due to the regional variation and more so the study area. NAUTH is a tertiary centre that offers both primary, secondary and tertiary level health services, and also being a

referral centre, most cases of acute watery diarrhoea would rather present to primary health care centres (PHCs) before presenting to NAUTH. In addition, it is located in a designated urban area in Anambra state.

Dairo *et al*²⁴ reported an acute watery diarrhoea prevalence rate of 21.1% in Kaduna North local government. The slightly higher prevalence rate reported by Dairo²⁴ when compared to the present study could be explained by some of the reasons given above (whereas the present study was a hospital based study, that of Dairo *et al*²⁴ was community based. They studied the prevalence and determinants of diarrhoea among infants in selected PHCs. PHC is the basic health centre and is located at the grass root and so it is patronised by many. A study in Jos²⁵ documented a prevalence rate of 20.7% for acute watery diarrhoea. Thiam *et al*²⁶ reported an acute watery diarrhoea prevalence rate of 26 % in under five children at Mbour, Senegal which was similar to 26.1% recorded by Wondwoson *et al.*²⁷ in Ethiopia and 25.2% documented by Ahmed *et al.*¹⁹ in India. All these buttress the fact that acute watery diarrhoea is a major cause of childhood morbidity in different nations. The relatively higher prevalence rates reported by other studies^{23,24} was due to the community based nature of their works. Community based studies are more likely to report higher prevalence when compared to hospital based studies. Some caregivers manage their children's diarrhoea at home and these diarrhoeal diseases resolve without the need for consultation at a health facility.

Among the study participants, 103 (65.0%) were males while 56 (35.0%) were females. The high prevalence of acute watery diarrhoea in males reported in this study was similar to what other authors^{16,22,23,28} recorded. The male to female difference is unclear although there are assumptions that males during infancy have to build a larger muscle mass than female infants.²² As a result of this, boys might have increased demands for micronutrients and are therefore more predisposed to a negative balance including lack of vitamin A and Zinc.²² This vulnerability might increase the role of diarrhoeal diseases and places the males as the weaker sex regarding infections. Another assumption was attributable to the genetic makeup of the male and female sex.^{29,30} Anyorikeya *et al*¹⁸ in Ghana reported a higher prevalence of acute watery diarrhoea in females which was in contrast to the finding of this work.

A higher prevalence seen in the younger age group (less than two years old) is also similar to what other works^{16,18,22,24,25,28} reported. The high prevalence in this age group could be as a result of immature immune system, poor weaning practices, and habit of oral phase (habit of putting everything in the mouth) associated with this age group.¹⁴

Majority of the admissions were in January to March 2017. The highest prevalence of acute watery diarrhoea was observed in the month of March. Other studies,^{16,28}

documented a seasonal variation of acute watery diarrhoea ranging from October to April and reported similar findings. Tagbo *et al*¹⁶ in Enugu, Southeast, Nigeria reported a peak diarrhoea season to be December to April. Souphatsone *et al*²⁸ in Lao People's Democratic Republic recorded a peak prevalence in March which was similar to what was obtained in this study. However, Anyorikeya *et al*¹⁸ in Ghana reported a highest diarrhoea prevalence during the rainy season (May to August), this contrasted what was documented in this study. Diarrhea is highly seasonal and is related to climate variability.³¹ Climate change brings about global warming with its attendant adverse health outcomes.³² Some epidemiological studies have affirmed the relationship between extreme weather conditions to increased incidence of diarrhea illness.^{33, 34}

A higher prevalence of acute watery diarrhoea was observed in the lower socio-economic class (66.6%), this is similar to what Burke³⁵ in Bolivia and Wondwoson²⁷ in Ethiopia reported. These works described an inverse relationship between socio-economic class and diarrhoeal diseases, with people in the low socio-economic more predisposed to diarrhoea diseases. This illustrates that diarrhoeal diseases are diseases of the poor and emphasis should therefore be greatly focused on prevention rather than on treatment.

Prior to presentation to our facility, home management of the diarrhoea had commenced. It was observed that these children received a combination of pharmacological agents.

These agents included Metronidazole, Paracetamol, ORS, anti-diarrhoeal medications, herbal medications and some medications, names unknown to mothers. These pharmacological agents were similar to what other authors^{36, 37, 38, 39, 40} reported. These caregivers spent money administering these medications with no resolution of symptoms, hence presentation to a health facility. It is worrisome that some of these medications might have been administered inappropriately with its attendant complications like drug resistance for antibiotics. Metronidazole (anti-anaerobe) is presumed to be a commonly abused medication for childhood acute watery diarrhoea. Viral agents are the most common causes of acute watery diarrhea¹⁵ There may not be any physiological basis for treating acute watery diarrhoea with Metronidazole, unless where it is indicated in cases of dysentery. Up to 45.8% of the study participants in this present study were given Metronidazole before presenting to a health facility. This is higher than 34.0% and 6.9% recorded by Ene-Obong³⁶ and Adimora *et al.*³⁸ respectively. The much lower rate (6.9%) of Metronidazole use documented by Adimora *et al.*³⁸ could be attributed to the educational level of their study participants; more than half of their study participants had tertiary education.

ORS was used in the home management of acute watery diarrhoea in 40.3% of the study participants. Even though,

ORS is cheap and readily available, its use is still low. This low utilization of ORS has been reported by other authors.^{38,39,40} Adimora *et al.*³⁸ in Enugu reported UNICEF ORS utilization rate of 9.9% which was much lower than 40.3% recorded in this study. Ogunride *et al.*³⁹ documented an ORS coverage rate of 8.6% in Maiduguri, this was lower than what was reported in this study. Ahmed *et al.*⁴⁰ reported ORS usage rate of 24.4% in Kashmir, India. Even though a usage rate of 24.4% is lower than what was reported in this study, it is higher than what Adimora *et al.*³⁸ and Ogunride *et al.*³⁹ documented. The much lower ORS utilization rate of 8.6% reported by Ogunride *et al.*³⁹ could be related to the study site, which is an area that is worst hit by insurgency and unrest with destruction of health facilities and killings of indigenes and health personnel. Carvajal-Vélez *et al.*⁴¹ in meta-analysis on diarrhoea management in under five children in Sub-Saharan Africa reported ORS coverage rate ranging from 17.0% to 85.0%. Many nations (91.7%) under study including Nigeria had an ORS usage rate of less than 50.0%. It was only Sierra Leone that had an ORS coverage rate of 85%. Uchendu *et al.*⁴² in Enugu recorded an ORS utilization rate of 73.1% which is higher than 40.3% reported in this study. However, this high utilization rate reported by Uchendu *et al.*⁴² is at variance with what Adimora *et al.*³⁸ recorded in the same study location. This difference could be due to the time of the study and the sample size. ORS if properly constituted and used, will prevent or treat dehydration and electrolyte imbalance which are common complications of acute watery diarrhoea and are major causes of death from acute watery diarrhoea. There is an urgent need for strengthening health education on proper and timely usage of ORS by mothers and entire populace especially the patent medicine dealers. These drug vendors can be trained to issue ORS to their customers instead of giving them other medications that may be harmful. This may go a long way at improving ORS utilization as these patent medicine dealers are within the communities. It will form a good community mobilization. With this, it may be comparable to what is obtainable in reducing maternal mortality by training of traditional birth attendants.

Conclusion

The prevalence of acute watery diarrhoea was high in NAUTH. The highest prevalence was observed in the age group < 12 months. The peak prevalence was recorded in the month of March and diarrhoeal diseases occurred predominantly in the low socio-economic class. There is still poor utilization of ORS and abuse of metronidazole and Antibiotics in general.

Efforts aimed at preventing diarrhoea disease and continued training of health workers on adherence to WHO guidelines on management of acute watery diarrhoea might lead to reduction in the diarrhoeal disease burden.

What this study adds

The prevalence of acute watery diarrhoea is high. The highest prevalence was found in the month of March. Acute watery diarrhoea affects the lower socio-economic group more. ORS utilization is low.

The limitation of this study: being a hospital based study with reference to admissions might have undermined the true prevalence of acute watery diarrhoea.

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