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Assessment of knowledge and practice of zinc sulphate supplementation in the treatment of diarrhoea among under-five children in Primary Health Care centres in Keffi, Nigeria

Kamal A. IBRAHIM[1*], Simeon OMALE[2], Danlami W. DAYOM[3], Ogbonna Brian ONYEBUCHI[4]

[1]Department of Pharmaceutical Services, Federal Medical Center, Keffi. Nigeria.
[2]Department of Pharmacology and Toxicology, [3]Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmaceutical Sciences, University of Jos, Jos. Nigeria.
[4]Department of Clinical Pharmacy and Pharmacy Management, Nnamdi Azikiwe University, Awka.. Nigeria.

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Abstract
Zinc supplementation reduces the severity, duration and recurrence of diarrhoea in children. This study assessed the level of knowledge and practice of zinc supplementation in the management of diarrhoea in children in primary health care facilities in Keffi, Nigeria. Retrospective and qualitative studies were conducted in nine facilities. Validated data collection form and questionnaire were used to collect medications prescribed for diarrhoea in children less than five years old. Descriptive statistics was done, and associate variables were tested using Chi-square Tests. The study assessed 380 case files and 19 health care workers in nine facilities. The finding revealed that 21.1% and 10.5% of the prescribers were aware of and had formal training on the use of zinc in the management of diarrhoea respectively. Oral rehydration salt with zinc and antibiotics were prescribed in 10.5% and 57.9% cases respectively. Only 13.2%, 8.2% and 8.5% of children managed for diarrhoea had correct doses, frequencies and durations of zinc respectively. Only 44.4% facilities had zinc tablet in stock. The study revealed low knowledge and practice among primary health care workers about treatment guidelines on zinc supplementation in the management of diarrhoea in children less than five years.

Keywords: Zinc supplementation; Diarrhoea; Knowledge; Primary Health Care

INTRODUCTION

Diarrhoea is defined as an illness in which waste matter is emptied from the bowels much more frequently than normal and in liquid form [1]. It is usually a symptom of gastroenteritis (bowel infections), which can be caused by viruses (rotavirus), bacteria (Campylobacter spp., *Clostridium difficile*, *Escherichia coli*, Salmonella spp. or Shigella spp.) which are the leading causes of food

*Correspondence. *E-mail*: kalfatkalsan@gmail.com *Tel*: +234-7035882000. ISSN 0189-8442

poisoning and some intestinal parasites such as giardia. Diarrhoea can last several days and often leave the body without the water and electrolytes that are necessary for survival (dehydration). Children who are malnourished or have impaired immunity as well as people living with Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome (HIV/AIDS) are most at risk of life-threatening diarrhoea [2]. Diarrhoea prevention can be achieved by Vitamin A supplementation, use of Co-trimoxazole prophylaxis for all HIV-infected and exposed infants and children aged 6 months to 5 years [3]. Breastfeeding improved feeding practices, food safety, regular hand washing with soap and water, use of latrines, safe disposal of stools and use of safe water play important roles in prevention of diarrhoea in children [3-5]. Diarrhoea is associated with 18 % mortality among children aged less than five years, accounting for 1.9 million deaths annually primarily in developing countries [6]. Implementation of diarrhoea prevention measures has resulted in a decline in diarrhoea mortality from an estimated 4.5 million deaths in the early 1980s to 1.3 million in 2008. Acute diarrhoea continues to be a burden on children particularly in developing countries [7, 8].

Zinc supplementation has been found to reduce the duration and severity of diarrhoea episodes and likelihood of subsequent infections for 2–3 months [9]. Therefore, the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) included zinc supplementation in the treatment of acute diarrhoea in May, 2004 [8]. This guideline includes the use of low osmolality Oral Rehydration Salt (ORS) and a 10-14 day-treatment with 10 mg per day of zinc tablets for infants less than 6 months or 20 mg per day of zinc tablets for older children [10, 11]. Zinc supplementation benefits children with diarrhoea because it is a vital micronutrient essential for protein synthesis, cell growth and differentiation, immune function, and intestinal transport of water and electrolytes [12, 13]. Zinc is also important for normal growth and development of children both with and without diarrhoea [7].

Zinc deficiency leads to increased risk of gastrointestinal infections, adverse effects on the structure and function of the gastrointestinal tract, and impaired immune function [13, 14]. Dietary deficiency of zinc is especially common in low-income countries because of a low dietary intake of zinc-rich foods or inadequate absorption caused by its binding to dietary fibre and phytates often found in cereals, nuts and legumes [14, 15]. Evidence has shown that zinc treatment is effective and generally safe [16]. A systematic review of studies in HIV-negative children provided evidence that zinc supplementation reduces the duration of acute or persistent diarrhoea [17]. A previous study in Benin Republic reported that nearly all the health care providers (96%) prescribed zinc in the management of diarrhoea [18]. Prescription of zinc to children with diarrhoea at the appropriate dose, frequency and duration will enhance and ensure maximal effect of zinc on cases of diarrhoea [19].

The awareness of the inclusion of zinc in the management of childhood diarrhoea among health care providers has been reported to be high in some developing countries [20]. Despite this growing awareness, its use in diarrhoea treatment in many of these countries has lagged behind [11, 21]. Success in reducing death and illness due to diarrhoea depends on acceptance of the scientific basis and benefits of these new therapies by governments and medical communities. It also depends on reinforcing family knowledge of prevention and treatment of diarrhoea and providing information and support to the families. [3, 9].

Series of studies were conducted to assess the use of current recommendation for the management of diarrhoea among children less than five years old [22-24]. Although the

benefits of zinc supplementation in the management of diarrhoea have been established, there remain a number of barriers to the widespread implementation of this treatment strategy. Currently, zinc is not used to treat most cases of diarrhoea because the known benefits of zinc supplementation are still not widely appreciated by physicians and other health care workers in developing countries [25]. Thus, there is need to assess the knowledge and practice of health care workers on the inclusion of zinc supplementation in the management of diarrhoea in PHCs which are the closest health facilities to the communities [22]. The purpose of this study was to assess the level of knowledge and practice of zinc supplementation in the management of childhood diarrhoea among Health care workers in PHC facilities in Keffi Local Government Area (LGA) of Nasarawa state of North Central part of Nigeria.

METHODS

Study design. A cross-sectional study was used to collect the relevant data on knowledge and practice of healthcare workers on Zinc supplementation for diarrhoea treatment in children aged less than five years old in PHC facilities.

Study setting. The study was conducted between February 2014 and January 2015 in nine selected PHC facilities of Keffi LGA of Nasarawa State, Nigeria, with mass area of 138 km^2 and population of about 92,664 as at the 2006 National census. The population of Keffi Local Government Area (LGA) comprises of a mixed group of persons from different ethnicity with diverse social and economic background. The area has twelve (12) established functional primary health care facilities spread across the locality with over nine to ten thousand (9,000-10,000) patients that accessed health services every year. Each facility has at least two trained health care personnel.

Study populations and sample size. The study population comprised of children aged less than five years who were managed for diarrhoea in the study facilities in Keffi Local LGA, within the study period and all prescribing health care workers in the study facilities. The minimum sample size was determined to be 380 using Rule of the thumb (20% of total diarrhoea cases seen for the period under review) [26].

Ethical consideration. Ethical and administrative approvals were sought and obtained from Health Research Ethics Committee (HREC) of Federal Medical Centre (FMC) Keffi, and Primary Health Care authority of Keffi LGA respectively. The ethical approval number was FMC/KF/HREC/037/14.

Data collection tools and procedure. A suitably structured data collection form and questionnaires with closed ended questions were designed and used to collect relevant data from patients medical case files retrospectively and prescribing health care workers during the study. The questionnaire had two sections, comprising of demographic information section and detail of drugs prescribed for the treatment of acute diarrhoea in children of age less than five years.

Inclusion and exclusion criteria. Children of age less than five years old who received treatment for diarrhoea in the selected PHC facilities of Keffi LGA within the period of interest and all prescribing Healthcare workers in the same facilities were included. However, all medical case files that did not satisfy the inclusive criteria and all non-prescribing health workers in the same PHC Facilities were excluded from the study. Convenient sampling method was used to select patients' medical case files from Health Information Management (HIM) units of the study facilities. Medical case files number of children less than five years treated for diarrhoea were collected from Health

Information Management (HIM) units of the study facilities. All the selected case files were assessed to collect patients' demographic data and medications prescribed for the treatment of diarrhoea and recorded accordingly in the data collection form.

At every facility visited the aim of the study was explained to health care providers and their verbal consent was sought and obtained prior to the interview. Twenty healthcare personnel were recruited for interview but and only nineteen were eligible and included in the study. The interview was self-administered by the investigator and responders provided relevant information which was the entered into questionnaire accordingly.

Data analysis. The data collected were analysed with the aid of Statistical Package for Social Sciences (SPSS) version 20 to generate descriptive statistics using basic frequencies and cross tabulations. The Chi-square test of association was carried out to determine associations between variables. A significance value was set at $p < 0.05$.

RESULTS

Table 1 shows that 201(52.9%) and 179 (47.1%) male and female children respectively were treated for acute diarrhoea in the period under review. Similarly, the data revealed that 167 (43.9%) and 128 (33.7%) of children treated were within the age range of 1-12 months and 13-24 months respectively. A total of 302 (79.5%) prescriptions were written by Community Health Extension Workers (CHEW). Table 2 revealed that 95% of health care worker respondents were female, majority (58 %) were of the age ranging from 20 – 35 years and 68.4% of the participants were trained as community health extension workers (CHEW). It also shows that 18 (94.7%) of the prescribers had 1-15 years working experience.

A total of 50 children received zinc during management of diarrhoea, among which 36 (72%) of them were of age greater than six months and 14 (28%) were of age 1-6 months. (Figure 1)

It was observed that 119 (31.3%) children were given ORS with other drugs, however, 79 (20.8%) received ORS only. Zinc was administered to 50 (13.2%) among which 40 (10.5) were given ORS in addition to the zinc. About 378 (99.5) of the children were diagnosed to have acute diarrhoea (Table 3). The result showed that 8.2% and 5% of children had doses of 20mg and 10mg respectively. Out of 360 files assessed 30 (8.2%) of children were administered zinc at 24 hourly frequencies, however, 4% and 1.1% children received zinc for 10 days and 20 days respectively (Table 4).

All the 19 health care personnel prescribed drugs for patients, their drugs of choice for the treatment of diarrhoea include metronidazole, Cotrimoxazole, ORS while 4 (21.1%) considered zinc as drug of choice in their treatment plan. However, 16 (84.2%) and 17 (89%) of them did not know the role of zinc in the management of diarrhoea and had no formal training on the use of zinc supplementation in the treatment diarrhoea of respectively (Table 5).

Four (4) Facilities out of nine (9) had zinc tablet in stock during this study. Children case file without zinc prescribed for the treatment of diarrhoea was significantly higher than those containing zinc supplement (50) $p=0.0001$. The number of the health care workers who had formal training on the use of zinc in the treatment of diarrhoea was statistically significantly lower than those who have not been trained (16) $p=0.03$ (Table 6).

Table 1: Demographic data of children treated for acute diarrhoea

Description		Frequency (n=380)	Percent (%)
Sex	Female	179	47.1
	Male	201	52.9
Age group (Months)	1 to 12	167	43.9
	13 to 24	128	33.7
	25 to 36	46	12.1
	37 to 48	22	5.8

Table 2: Socio-demographic characteristics of prescribers in Primary Health Care centres

Description	Category	Number (n=19)	Percentage (%)	Cumulative %
Sex	Female	18	95	95
	Male	1	5	100
Age	20 – 35	11	58	58
	36 – 50	8	42	100
Category of health workers	CHEW	13	68.4	68.4
	CHO	1	5.3	73.7
	NURSE	4	21.1	94.7
	JCHEW	1	5.3	100
Qualification	Certificate	5	26.3	26.3
	Diploma Certificate	14	73.7	100
Rank	In Charge	8	26.3	26.3
	Staff	10	52.6	94.7
	Volunteer	1	5.3	100
Years in Service	1-15	18	94.7	94.7
	16-30	1	5.3	100

CHEW= Community Health extension worker, JCHEW= junior community Health extension worker, CHO = Community Health Officer

Table 3: Medicines prescribed and types of diarrhoea treated in the medical case files

Description	Category	Frequency (n=380)	Percentage (%)
Medicines	ORS alone	79	20.2
	ORS + antibiotic only	119	31.3
	ORS + Zinc only	40	10.5
	Zinc alone	10	2.7
	ORS + Zinc + antibiotic + other drugs	220	57.9
	Antibiotics alone	120	31.5
Type of antibiotics used	Cotrimoxazole	204	53.7
	Metronidazole	220	57.9
	IVF + other drugs	46	12.1
Types of diarrhoea treated	Acute diarrhoea	378	99.5
	Dysentery	2	0.5

Table 4: Doses, Frequency and duration of zinc administration in the treatment of acute diarrhoea at the facilities

Description	Category	Frequency of dose (n=330)	Percentage (%)
Dose (mg)	10	19	5
	20	31	8.2
	*NA	330	86.8
Frequency of administration	Once daily	31	8.2
	Twice daily	19	5
	*NA	330	86.8
Duration (day)	<10	18	4.7
	10	28	7.4
	20	4	1.1
	*NA	330	86.8

NA = Not applicable

Table 5: Prescribers' knowledge and practice of zinc supplementation in the treatment of acute of diarrhoea

Respondents	Category	Frequency (n)	Percentage (%)	Cumulative
Types of drugs prescribed	Metronidazole (YES)	19	100	100
	Cotrimoxazole (YES)	19	100	100
	ORS (YES)	19	100	100
	Zinc (YES)	4	21.1	21.1
Knowledge of Role of Zinc in	YES	3	15.2	15.2
the treatment of diarrhoea	NO	16	84.2	100
Formal training on the use	YES	2	10.5	10.5
of zinc in diarrhoea	NO	17	89.5	100
Zinc availability	YES	4	44.44	44.44
in the facilities	NO	5	55.56	100

N=19, ORS = Oral Rehydrated Salt

Table 6: Knowledge and practice of zinc supplementation in treatment of diarrhoea/availability of zinc

Assessment	Yes	No	mean diff.	95% CI	p-value
Formal training on use of zinc in AD	2.00	17.00	15.00	3.60-22.94	0.03
Knowledge of role of zinc in diarrhoea treatment	3.00	16.00	13.00	10.03-19.97	0.006
Number of Zinc prescribed in the case files	50.00	330.00	280.00	255.16-304.84	0.0001

AD = Acute diarrhoea

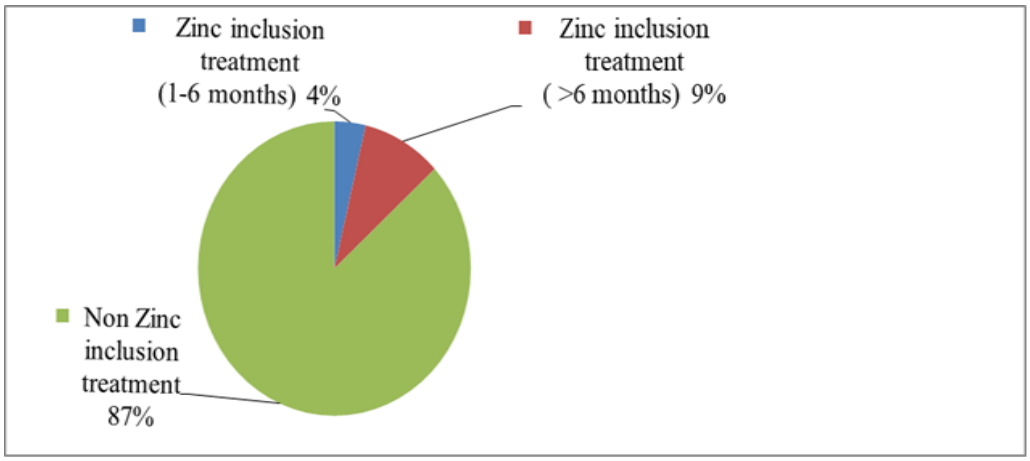

Figure 1. Age's distribution of children who received zinc in the treatment of acute diarrhoea

DISCUSSION

In this study, it was observed that more than 50% of children treated for acute diarrhoea were male compared to less than 50% female children. This gender distribution is in line with Nigeria Demographical Health Survey finding which reported that cases of diarrhoea was higher in male children than that of female children [27]. This study shows that children of age 1-12 months had higher prevalence of acute diarrhoea compared to those of age 13-24 months. Majority of children of this age category may either be crawling or at the stage of teeth formation, this may predispose them to poor sanitary condition which may increase their contact with contaminated surfaces and objects [28]. Lower proportion(5.3%) of the prescriptions were made by Community Health officer (CHO) this is in contrast with previously reported findings of [19] which revealed that Community Health Officer (CHO) prescribed zinc more than other categories of health workers. This difference may be due to the fact that majority of primary health care workers in these settings were Community Health Extension Workers. The demographic characteristic of the prescribers showed that the proportion of female prescribers was tenfold that of male prescribers. All clinical

staff of the PHC Centres prescribed drugs for patients. This may be due to limited numbers of the health care workers at each of the facilities thus necessitating the need for employment of more health care workers across the PHC facilities.

The study further revealed that only few 3(15.2%) of the health care workers were aware of the use of zinc in the management of diarrhoea in children. This finding is contrary to the study conducted in Benin City, Nigeria, which reported that higher proportion of the health care workers were aware of the zinc supplementation in the management of diarrhoea in children [23]. Thus the findings of the present study may be attributed to lack of formal training of the health care workers in Keffi, Nasarawa state on the use of zinc in the management of diarrhoea in children as recommended by WHO/UNICEF. More so, slightly more than 10% prescriptions had the recommended treatment, which is ORS along with zinc with no additional antibiotics in accordance with the WHO/UNICEF guideline. This finding showed a higher proportion of use of ORS and Zinc compared to the study conducted in Ujjain, India which reported that less than 1% prescription had recommended treatment of ORS and zinc alone without antibiotic [29]. It is also worthy to know that ORS use in this study was shown to be less than half of the total number of prescriptions provided for children managed for diarrhoea in the facilities. This outcome is different from similar study reported in literature [30], which stated that ORS was included in the management of diarrhoea disease in less than 10% of cases.

The study revealed that less than 12% of primary health care workers had received formal training on the use of zinc in the management of childhood diarrhoea. This finding is different from what was reported in Benin City, Nigeria where more of them had received formal training on the use of zinc supplementation in the management of diarrhoea [23]. This situation can be improved by provision of training programme for health care workers which will present excellent opportunities to review the basic diarrhoea control strategy in addition to the current guidelines by the WHO [31]. This will be of more benefit to primary health care workers who are usually the first level contact with patients in the community and have a unique one-on-one opportunity to influence compliance to the treatment recommendation by informing and teaching mother/caregiver home – diarrhoea therapy including zinc supplementation and ORS.

The assessment shows that less than 50% of PHC facilities had zinc tablet in stock at the time of the study. This finding is not different from what was obtained from a previous study in Benin City Nigeria, which reported that less than half of the PHCs had zinc tablet in stock at the time of the study [23]. The limited availability of zinc in these facilities may be due to lack of adequate knowledge about the use of zinc in the treatment of diarrhoea in children. The study further showed that antibiotics alone were prescribed for more than 30% of children treated for acute diarrhoea. This value obtained is greater than that reported in a retrospective study conducted in a private tertiary care hospital in Chennai, India [22].

Table 4 shows that only a small proportion of children managed for diarrhoea had correct doses (13.2%), correct frequency (8.2%) of administration and correct duration of therapy (7.4%) for zinc. This outcome is in contrast to what was reported in Benin City, Nigeria where majority of health care workers prescribed correct doses of zinc and less than half of them prescribed correct duration [23]. This finding draws attention to the need for formal training of health care providers on the use of zinc in the management of diarrhoea with emphasis on basic key information about correct dose, frequency and duration of therapy. Prescription of zinc for children with

diarrhoea at the appropriate dose, frequency and duration will enhance and ensure maximal effect of zinc on cases of diarrhoea [19]. Another study in Benin Republic reported that nearly all of the health care providers (96%) prescribed zinc for diarrhoea treatment [18]. It is important to note that less than half of patients received ORS alone in addition with other drugs not included in the guideline. This report is similar to that reported in Ujjain Indian which revealed that ORS alone was prescribed in 58% of the prescriptions in addition with other drugs not included in the guideline [29].

Currently zinc is not used to treat most cases of diarrhoea because the known benefits of zinc supplementation are still not widely appreciated by health care providers in developing countries [27]. Knowledge of proper use of ORS and zinc in the management of diarrhoea may correct this irrational perception and improve management of diarrhoea in children. The study further revealed that all the respondents use antibiotics in managing cases of acute diarrhoea in children under five years. This finding is different from that reported in a study conducted in Benin City, Nigeria where the use of antibiotic in management of diarrhoea in children was reported by only one respondent [23]. However, the finding was similar to that reported in Benin Republic where majority of the health care providers prescribed an antibiotic in addition to zinc [18]. Evidence has shown that more than 80% of diarrhoea death can be prevented with widespread use of low osmolality ORS and zinc and decline in the use of antibiotic for case. The number of health care workers who had knowledge of the use of Zinc in the treatment of diarrhoea was statistically significantly lower than the number of those who does not have knowledge of the use of Zinc in the treatment of diarrhoea P= 0.06. This finding implies that there is lack of training and retraining of health care providers in this setting as already shown above. Medical case files without prescribed zinc for the treatment of diarrhoea was statistically significantly higher than those that contained zinc supplement (P= 0.0001). This low compliance to the WHO guideline on inclusion of Zinc in the treatment of diarrhoea may be linked to lack of training and knowledge of the importance of its inclusion in the management of diarrhoea in children of under-five years old. Less than half of the facilities had Zinc in stock at the time of this study.

Conclusion. The study revealed low knowledge and inadequate compliance to World Health Organization (WHO) standard treatment guidelines of ORS and zinc prescribing for acute diarrhoea management in children below five (5) years in primary health care facilities in Keffi LGA of Nasarawa state. A major public health concern is the low practice of zinc supplementation and high use of antibiotics, by the health care workers in these facilities. Adherence to the treatment guidelines can be improve via massive training and sensitization advocacy for health care workers on the use of zinc in the management of diarrhoea disease as recommended by WHO at all levels of Health care delivery.

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