Caregivers utilisation of zinc plus oral rehydration solution for home management of childhood diarrhoea in rural and urban communities of Kano, Nigeria

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Abstract

Diarrhea remains a major cause of morbidity and mortality globally, and still poses a significant threat to the health, wellbeing and survival of under-fives in many developing countries, especially in Africa. This is despite the existence of simple, effective treatment – zinc plus ORS. A comparative cross- sectional design was used to collect information from 302 caregivers. Data was analysed using SPSS version 20. Utilization of zinc plus ORS by caregivers was found to be good (73.5%) in both settings; up to 120 (78.9%) of the caregivers in the urban community compared to over two-thirds 102 (68.0%) of those in the rural community had used zinc plus ORS. This difference was statistically significant between urban and rural caregivers (P=0.01). Caregivers having poor knowledge of zinc plus ORS were 98% less likely to use zinc plus ORS (P=0.00, AOR=0.02, 95% CI=0.00-0.12), caregivers whose children had non severe diarrhoea are 80% less likely to use zinc plus ORS (P=0.00, AOR=0.20, 95% CI=0.09-0.47) and caregivers in urban areas are 1.5 times more likely to give zinc plus ORS for any episode of diarrhoea (P=0.01. AOR=1.53, 95% CI=1.48-4.54). Utilisation of zinc plus ORS was fair in both rural and urban areas of Kano and continued efforts to reach caregivers using a variety of channels are needed to change caregiver's knowledge and utilization of zinc plus ORS and alter incorrect diarrhoea treatment practices.

Introduction

Diarrhoea is one of the leading causes of death among children under the ages of five years globally. It accounts for 9% of all under-five deaths: a loss of more than 531,000 child lives in 2015.[1] Most of these deaths occur among children less than 2 years old. Diarrhoea remains a major cause of morbidity and mortality globally and still poses a significant threat to the health, well-being and survival of under five in many developing countries today, especially in Africa and South East Asia, and accounts for as much as 16% of childhood deaths.[2] According to the 2013 Nigeria National Demographic and Health Survey (NDHS), 1 in 10 children under the age 5 years in Nigeria had diarrhoea, and 1 in 50 had diarrhoea with blood, in the two weeks prior to the survey.[2] Today, many children with diarrhoea in low-income countries do not receive the recommended treatment, and trend data suggest that there has been little progress since 2000.[3] Current evidence suggests that advances in managing diarrhoeal diseases, zinc supplementation for the treatment of diarrhoea has been shown to decrease the duration and severity of the diarrhoeal episode, diarrhoea hospitalization rates and, in some studies, all-cause mortality.[3,4] Diarrhoea has been defined as the passage of three (3) or more loose or watery stools per day, or more frequently than is normal for the individual.[5] It's usually a symptom of gastrointestinal pathology, caused by malnutrition and a variety of bacterial, viral and parasitic organisms. Infection is spread through contaminated food or drinking water, or from person to person as a result of poor hygiene. Severe diarrhoea leads to fluid loss, and may be life-threatening, particularly in young children and people who are malnourished or have impaired immunity.[4] Other complications will include electrolyte imbalance, malnutrition, irritable bowel syndrome and death if untreated. Other important causes of diarrhoea include under-nutrition.[6] Effective interventions that have been shown to reduce morbidity and mortality from diarrhoea in addition to prevention and treatment of dehydration with appropriate fluids include: breastfeeding, continued feeding and selective use of antibiotics.[3,5] These interventions reduce the duration and severity of diarrhoeal episodes and lower their incidence. Because these are simple interventions that require minimal skills and can be successfully implemented at home, families and communities are key to achieving the goals, especially in lower income countries.[5,7,8]

The WHO and UNICEF issued joint statement recommending low-osmolarity oral rehydration salts (ORS) and zinc in management of childhood diarrhoea. Zinc supplementation reduces the severity, duration and recurrence of childhood acute diarrhoea. These beneficial effects of zinc in the treatment of diarrhoea led to the inclusion of a 10-14 days treatment regimen by the WHO/UNICEF[5] but many children are still dying because these interventions are often not available or accessible where they are needed most.[5,6]

Majority of diarrhoea related deaths occur at home, thus - caregivers utilisation of an effective intervention in the form of zinc plus ORS is extremely needed to significantly reduce these avoidable deaths. In addition to poor access to proper health care, most diarrhoeal episodes occur at home and may even end without necessarily any contact with the health care system. Information on the potential barriers and enablers to scaling up zinc plus ORS treatment for diarrhoea in northern Nigeria and especially Kano State is lacking.

Prevention and treatment of dehydration with appropriate fluids, breastfeeding, continued feeding and use of zinc plus ORS will reduce the duration and severity of diar-

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rhoeal episodes and lower their incidence. Families and communities are key to achieving the goals set for managing the disease by making the new recommendations routine practice in the home and health facility. With Kano State having 6.5% share of the national burden of diarrhoeal diseases among under- five children in Nigeria.[2] Scaling up the use of zinc plus ORS can dramatically save the lives of these children. Baseline data is therefore needed with respect to utilisation and barriers to the use of zinc plus ORS by caregivers as well as on identifying enabling factors for use of zinc plus ORS among children under-five years of age. The study aimed to assess utilisation of zinc plus ORS and associated factors among caregivers of under fives. The study compared rural and urban areas because in sub-Saharan Africa, rural and urban populations differ demographically, in socio-economic and cultural composition, and in proximity to formal and informal treatment sources. Urban populations are generally younger, better educated, and more ethnically heterogeneous than rural populations. Also, government health services, private health facilities, pharmacies and drug shops selling over-the-counter medications are concentrated in urban areas.

Materials and Methods

Study design

A comparative cross- sectional design was used to assess caregiver's utilisation of zinc plus ORS in rural and urban communities of Kano, Nigeria. Kano is one of the 36 States of the Federal Republic of Nigeria and it lies between latitude 130 N in the North and 110 N in the South and longitude 80 W in the West and 100 in the East.

Study population

The study population comprised of caregivers of children within the ages of 0 – 59 months who had diarrhoea in the three months prior to the survey.

Sample size determination

Sample size for the study was estimated using the formula for comparing two proportions,[10] as stated below:

$$n = \frac{(Z\alpha+Z_{1-\beta})^2[P_1(1-P_1)+P_2(1-P_2)]}{(P_1-P_2)^2}$$

n = minimum sample size in each group
$Z\alpha$ = Value of the standard normal deviate corresponding to the α level of significance at 95% (normal distribution table value = 1.96)
$Z_{1-\beta}$ = Value of the standard normal deviate corresponding to the power of the test at 80% (normal distribution table value = 0.84)
P_1 = Proportion of caregivers (in rural areas) who gave zinc plus ORS to children with diarrhoea (32).[11]
P_2 = Proportion of caregivers (in urban area) who gave zinc plus ORS to children with diarrhoea (49.7).[12]
P_1-P_2 = Difference in proportion between children treated with zinc plus ORS.

$$n = \frac{(1.96+0.84)^2\,[0.32(1-0.32)+0.49(1-0.51)}{(0.32-0.49)^2}$$

$$n = 2.630908/0.017424 = 140$$

A ten percent (10%) non-response rate was added. Hence, the sample size of 154 caregivers each in the urban and rural areas was obtained.

Sampling technique

A multistage sampling technique was used to select participants – LGA, Ward, Settlement, Household and Respondents.

Study Instrument

An interviewer – administered, pre-tested, semi-structured questionnaire adapted from previous studies,[13,14] was used to collect data from eligible caregivers, after pre-testing the questionnaire, it was adjusted to suit cultural appropriateness. Pre-testing also tested the ability of trained research assistants to administer the questionnaire.

Data analysis

Data collected were cleaned, entered and analysed using IBM SPSS version 20. Utilisation of zinc plus ORS was the dependent variable while the independent variables included caregiver's age, age of index child, respondents' sex, child's sex, place of residence, ethnicity, religion, marital status, place of residence, educational status, occupation, income, spouse's educational status, partner's occupation and number of living children. Chi-square test or Fisher's exact test was used where appropriate to analyse factors associated with caregiver's utilisation of zinc plus ORS. P value <0.05 was considered statistically significant. At multivariate level, all variables found to have P<0.05 were entered into the binary logistic regression model to obtain adjusted odds ratio with 95% confidence intervals for predictors of utilisation of zinc plus ORS.

Results

Socio-demographic characteristics of respondents

The mean ages (± SD) of respondents in the urban and rural communities were 26.4±6.7 and 24.8±5.4 years respectively. About half (51.9%) of the caregivers that participated in the study were in the age group 15-24 years. More than a third (38.7%) of participating caregivers in the urban community were in the age group 25-34 years compared to a quarter (27.6%) of those in the rural community. Most caregivers from both communities 98.0% urban versus 96.7% rural were Hausa and of the Islamic faith 95.3% versus 94.0 %, respectively. More than a third (41.4%) of the respondents in the urban community had secondary education as against (26.2%) of their rural contemporaries. Close to half (47.4%) of the caregivers in the rural setting have no formal education. The main occupation of caregivers participating in the urban LGA 77.0% was petty trading while majority of rural 75.7% respondents were housewives; followed by civil servants (15.3%) in the urban and petty traders (15.1) in the rural communities. Similarly, 16.7% *versus* 8.0% of the spouses of caregivers had tertiary education in the urban and rural communities respectively. The monthly income of urban respondents of ₦0 to ₦210,000 (median: ₦6,000) was higher than that of rural respondents (₦0 to ₦70,000; median: ₦3,500) (Tables 1 and 2).

Two third (73.5%) of the respondents in both settings were found to have utilized zinc plus ORS for diarrhoea management; up to 120 (78.9%) of the caregivers in the urban community compared to over two third 102 (68.0%) of those in the rural community had used zinc plus ORS (Tables 3 and 4). This difference was statistically significant between urban and rural caregivers (P<0.05).

At bivariate level, utilisation of zinc plus ORS was found to be significantly associated (P<0.05), with child's sex, respondent's sex, education, occupation, partner's education, knowledge, acceptability, severity of diarrhoea, partner's occupation and place of residence.

After adjusting for other covariates (child's sex, respondent's sex, occupation, partner's education, acceptability, and partners' occupation): knowledge, educational attainment, severity of diarrhoea and place of residence were found to remain independent predictors of utilisation of zinc plus ORS (Table 5), with caregivers having poor knowledge 98% less likely to use zinc plus ORS (P=0.00, AOR=0.02, 95% CI=0.00-0.115), caregivers whose children had non severe diarrhoea are 80% less likely to use zinc plus ORS (P=0.00, AOR=0.20. 95% CI= 0.09- 0.47), caregivers with informal

education are 75% less likely to use zinc plus ORS and caregivers in urban area are 1.5 times more likely to give zinc plus ORS (P=0.01, AOR=1.53, 95% CI=1.48-4.54) for any episode of diarrhoea.

Discussion

Utilization of zinc plus ORS by caregivers was fair (73.5%) in both settings; up to 120 (78.9%) of the caregivers in the urban community compared to over two third 102 (68.0%) of those in the rural community had used zinc plus ORS. This differ-

Table 1. Summary of socio-demographic characteristics of respondents.

Variable	Total, n (%)	Urban (n=150); n (%)	Rural (n=152); n (%)	χ^2	P value
Age group (years)				6.36	0.01*
15-24	157(51.9)	69(46.4)	80(53.6)		
25-34	110(36.4)	58(38.7)	42(27.6)		
35-44	30(9.9)	19(12.7)	29(19.1)		
45-49	5(1.8)	4(2.6)	1(0.7)		
Caregiver's sex					0.26†
Male	5(1.7)	5(3.3)	0(0.0)		
Female	297(98.3)	145(96.7)	152(100)		
Child's sex				0.86	0.35
Male	159(52.6)	83(52.5)	76(47.5)		
Female	143(47.4)	67(47.2)	76(52.8)		
Tribe					0.36†
Hausa/Fulani	294(97.4)	147(98.0)	147(96.7)		
Non-Hausa	8(2.6)	3(2.0)	5(3.3)		
Religion				0.23	0.62
Islam	286(94.7)	143(95.3)	143(94.0)		
Christianity	16(5.3)	7(4.7)	9(6.0)		
Child's age					
0 – 11 months	50(16.7)	30(20.0)	20(13.2)	2.56	0.11
12 – 59 months	252(83.3)	120(80.0)	132(86.8)		

†Fishers exact test. *Statistically significant.

Table 2. Other socio-demographic characteristics of respondents.

Variable	Total, n (%)	Urban (n=150); n (%)	Rural (n=152); n (%)	χ^2	P value
Marital Status					1.00†
Single	6(1.9)	3(2.0)	3(2.0)		
Married	296(98.1)	147(98.0)	149(98.0)		
Education				35.9	0.01*
None	50(26.6)	10(6.6)	40(26.7)		
Qur'anic	55(18.2)	24(15.8)	31(20.7)		
Primary	61(20.2)	27(17.8)	34(17.8)		
Secondary	121(41.4)	85(55.9)	40(26.7)		
Tertiary	11(3.6)	6(3.9)	5(3.3)		
Occupation				46.9	<0.001*
Civil servant	46(15.3)	120(80.0)	13(8.6)		
Business	134(77.0)	23(15.3)	24(15.1)		
Housewives	135(6.6)	7(4.7)	115(75.7)		
Income				10.9	<0.001*
<$2/day	246(81.5)	100(66.7)	146(96.0)		
≥$2/day	56(18.5)	50(33.3)	6(4.0)		
Caregiver type				8.29	0.02*
Grandmother	106(33.8)	60(40.0)	42(26.6)		
Mother	162(55.0)	70(46.7)	96(63.2)		
Others	31(11.2)	20(13.4)	14(7.2)		
Partner's Education				24.9	<0.001*
None	19(6.3)	6(8.7)	13(3.9)		
Quranic	44(14.6)	10(22.7)	84(6.6)		
Primary	31(10.3)	12(12.7)	19(7.9)		
Secondary	148(49.0)	89(39.3)	74(73.6)		
Tertiary	60(19.9)	35(16.7)	10(8.0)		
Partner's occupation				12.33	<0.001*
Unemployed	42(15.9)	35(23.3)	13(8.6)		
Employed	254(84.1)	115(76.7)	139(91.4)		
Number of living children					0.49†
1-4	301(99.7)	149(99.3)	152(100)		
≥5	1(0.7)	1(0.7)	0(0.0)		

†Fishers exact test. *Statistically significant.

ence was statistically significant between urban and rural caregivers (P=0.01). However, few caregivers in both rural and urban areas failed to complete the prescribed doses of zinc plus ORS. The result of the study showed a relatively higher rate of zinc plus ORS utilisation when compared with data from some studies in northern Nigeria; where a survey in northern Nigeria that focused on determining baseline data with respect to coverage, adherence and barriers to utilization of zinc and ORS observed that the coverage and utilization of zinc plus ORS for the treatment of diarrhoea were found to be 8.8% and 0.2% respectively.[15] Similarly, a cross sectional survey in north western Nigeria found that ORS use was abysmally low at 8.6%.[16] Only 32% of caregivers use zinc in the management of diarrhoea and adherence to 10-day zinc supplementation was encouraging at 75.5%.[16] NDHS 2013 also reported a very low utilisation of zinc (3.1%) and ORS (39.4%) for the northwest region.[2] However, the study result was comparable to MICS 2016/2017 report where zinc and ORS dosing compliance rate for children

Table 3. Utilisation of zinc plus ORS.

Utilisation	Urban n(%)	Rural n(%)	Total	χ^2	P-value
Yes	120(78.9)	102(68.0)	222(73.5)		
No	30(21.1)	50(32.0)	80(26.5)	5.80	0.01*

*Statistically significant difference.

Table 4. Factors associated with utilisation of zinc plus ORS.

Variable	Utilisation			χ^2	P value
	Yes, n(%)	No, n(%)	Total, n(%)		
Age				1.75	0.08
<30	164(71.6)	65(28.4)	229(75.8)		
>30	58(79.5)	15(20.5)	73(24.2)		
Child's sex				6.99	<0.01*
Male	127(79.9)	32(20.1)	159(52.6)		
Female	95(66.4)	48(33.6)	143(47.4)		
Respondent's Sex					<0.01†
Male	2(40.0)	3(60.0)	5(2.3)		
Female	197(90.8)	20(9.2)	217(97.7)		
Religion				0.19	0.66
Islam	211(73.8)	75(26.2)	286(94.7)		
Christianity	11(68.8)	5(31.2)	16(5.3)		
Tribe				2.96	0.08
Hausa/Fulani	216(75.5)	70(24.5)	286(94.7)		
Non Hausa	9(56.3)	7(43.7)	16(5.3)		
Marital Status				2.73	0.06
Single	6(46.2)	7(53.8)	6(3.3)		
Ever Married	214(74.0)	75(26.0)	296(96.3)		
Education				19.6	<0.01*
Formal	20(40.0)	30(60.0)	50(16.6)		
Informal	182(72.2)	70(27.8)	252(83.4)		
Occupation				13.6	<0.01*
Employed	161(68.5)	74(31.5)	235(77.7)		
Unemployed	61(91.0)	6(9.0)	67(22.2)		
Partner's Education					0.03†
Formal	18(94.7)	1(5.3)	16(5.4)		
Informal	200(72.1)	77(27.9)	280(94.6)		
Partner's Occupation				19.2	
Employed	23(47.9)	23(52.1)	48(16.2)		<0.001*
Unemployed	195(78.3)	55(21.7)	248(83.8)		
Knowledge				21.2	<0.001*
Fair/Good	215(71.1)	65(28.9)	280(92.7)		
Poor	5(11.7)	39(88.6)	44(7.2)		
Acceptability					<0.01†
Poor	42(100)	0(0.0)	42(18.9)		
Good	0(0.0)	180(100)	180(81.1)		
Severity				60.0	<0.001*
<4	30(39.0)	47(61.0)	77(25.50)		
≥4	190(84.4)	35(15.6)	225(74.5)		
Residence				5.80	<0.001*
Rural	102(68.0)	50(22.0)	152(50.3)		
Urban	120(80.0)	30(20.0)	150(49.7)		

Table 5. Predictors of utilisation of zinc plus ORS.

Variable	Utilisation n(%)	Crude OR	Adjusted OR (95% CI)	P value
Knowledge			0.02(0.00-0.12)	0.00*
Poor	44(14.6)	1		
Good/Fair	258(85.4)	3.78		
Severity			0.20(0.09-0.47)	0.00*
<4	230(76.2)	1		
≥4	72(23.8)	1.58		
Acceptability			1.17(0.08-1.93)	0.23
Poor	42(18.9)	1		
Good	180(81.1)	1.24		
Residence			1.53(1.48-4.54)	0.01*
Rural	120(54)	1		
Urban	102(46)	2.23		
Child Sex			4.90(0.33-30.17)	0.09
Male	159(52.6)	1		
Female	143(47.4)	6.33		
Caregivers Sex			2.94(0.66-13.25)	0.16
Male	5(1.7)	1		
Female	297(98.3)	3.4		
Education			0.25(0.09-0.69)	0.01*
Informal	50(16.6)	1		
Formal	252(83.4)	0.47		
Occupation			2.01(0.67-12.81)	0.15
Unemployed	67(22.2)	1		
Employed	235(77.8)	2.96		
Partner's Education			0.35(0.10-1.18)	0.91
Informal	280(94.6)	1		
Formal	16(5.4)	0.31		
Partner's Occupation			0.18(0.02-1.68)	0.18
Unemployed	248(83.8)	1		
Employed	48(16.2)	0.15		

*Statistically significant.

with diarrhoea was found to be 36.7% and 43.8% respectively for the north-western states of Nigeria.[17] The high proportion of zinc plus ORS users in this study group is likely because the State government (MOH and its parastatals) and development partners have been collaborating in improving the home management of diarrhoea and increasing the use of zinc plus ORS and the widespread availability of co-parked zinc plus ORS. Strategies used includes training/retraining of healthcare workers on use of zinc plus ORS, provision of zinc plus ORS to all patent medicine vendors, mass media campaigns and engagement of community key influencers in all the political wards in the state on childhood diarrhoea and other maternal and child health interventions.

Utilisation of zinc plus ORS was found to be significantly associated (P<0.05) with child's sex, caregiver's sex, education, occupation, partner's education, knowledge about zinc plus ORS, acceptability of zinc plus ORS, severity of diarrhoea, partner's occupation and place of residence.

After adjusting for other covariates: knowledge, education, place of residence and severity of diarrhoea remain significant predictors of utilisation of zinc plus ORS, with caregivers having poor knowledge 98% less likely to use zinc plus ORS, caregivers whose children had non severe diarrhoea are 80% less likely to use zinc plus ORS, caregivers with informal education are also 75% less likely to use zinc plus ORS and caregivers in urban areas are 1.5 times more likely to give zinc plus ORS for any episode of diarrhoea. A study in Kano found that availability of health centres and ORS were the main factors associated with utilisation,[18] while studies from some northern states and Edo (Nigeria) revealed availability of zinc plus ORS, knowledge, preference for herbal medicines, age, marital status, educational status and social class of mothers were significant determinants of utilisation.[19,20] A study on health utilization and attitude survey conducted in rural Gambia to identify possible predictors of diarrhoea and the decision to seek treatment at a health facility reported that signs of dehydration (dry mouth, lethargy), diarrhoea with fever and vomiting were found to be significant predictors of seeking treatment at a health facility.[21] Similarly, surveys in selected districts of Benin Republic, Nepal, Iran and India among caregivers cited that availability, compliance cards, caregivers' previous experience, SMS reminders, dehydration, severe diarrhoea, vomiting, counselling/advise by health workers and belief about effectiveness of zinc plus ORS was found to be associated with good utilization of zinc and ORS among the surveyed participants.[22-25]

Conclusions

Utilisation of zinc plus ORS was found to be fair in both rural and urban areas of Kano and continued efforts to reach caregivers using a variety of channels are needed to further improve caregiver's knowledge and utilization of zinc plus ORS and alter incorrect diarrhoea treatment practices. These efforts should be rigorously evaluated and accompanied by health promotion activities with all stakeholders to ensure adequate supply and availability of zinc plus ORS products in all facilities.

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