

# Medication use and abuse in childhood diarrhoeal diseases by caregivers reporting to a Nigerian tertiary health institution

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**Background.** Childhood diarrhoeal diseases have a major impact on morbidity and mortality. Prompt and appropriate interventions improve outcome.

**Objectives.** To evaluate the practice of mothers/caregivers with respect to use of antibacterial and antimotility drugs.

**Methods.** Caregivers of under-5s presenting from catchment areas of the University of Nigeria Teaching Hospital between October 2006 and February 2007 were interviewed by means of a structured questionnaire. Data obtained included perception of cause of diarrhoea, use of oral rehydration therapy (ORT) fluids, and use of antibacterial and antimotility drugs.

**Results.** Caregivers of 156 children met the inclusion criteria. Most mothers (53%) believed that the diarrhoea was caused by teething and 51% had used antibiotics (the commonest was metronidazole). Use of antibiotics was not influenced by the perceived cause of diarrhoea, level of maternal education or social status. Drug use delayed the time of presentation and was associated with more severe dehydration.

**Conclusion.** We found that home treatment of acute diarrhoea is characterised by unnecessary use of antibiotics and antidiarrhoeal agents. Intermittent public health campaigns and health care worker updates on the use of ORT and zinc supplements are needed. The latter may also satisfy caregivers' urge to give 'medicine' while at the same time reducing antibiotic abuse and drug resistance.

Diarrhoeal diseases are a leading cause of infant and under-5 morbidity and mortality worldwide, with an estimated 1.8 million deaths each year, accounting for 17% of childhood deaths.<sup>1-5</sup> These negative effects are most significant in developing countries.<sup>6,7</sup> Diarrhoea starts at home, so early and appropriate treatment by caregivers before the child is brought to hospital will greatly contribute towards reducing the morbidity and mortality. Families and communities are the key to achieving the goals set for managing diarrhoea.

Good home management consists of both prompt and correct use of oral rehydration therapy (ORT) solutions and avoidance of inappropriate use of antibiotics and other drug preparations. ORT is well established worldwide as the mainstay of national diarrhoea control programmes.<sup>4</sup> Compared with intravenous hydration, ORT has been shown to be effective, safe, less painful, and less costly in treating mild to moderate dehydration.<sup>6</sup> Although global efforts to promote ORT in various forms resulted in an initial decrease in mortality from diarrhoeal illness when appropriately used, the decline in morbidity and mortality patterns from diarrhoeal illness in developing countries has not always been sustained.<sup>6-8</sup>

Recommendations on use of drugs in the management of acute watery diarrhoea should be followed strictly, since indiscriminate use of antibiotics results in development of resistance. Addition of 'harmless' but unnecessary drugs under pressure from business shifts the emphasis from the standard management (oral rehydration solution, feeding and zinc supplementation) of acute childhood diarrhoea.<sup>9,10</sup> Such additions also put an unnecessary financial burden on families and the larger community. However, there is often a problem with monitoring caregivers' practices with regard to adherence to these standard recommendations.

We investigated the extent of use of antibacterial agents and other drugs by caregivers in home treatment of simple watery diarrhoea before presentation at a tertiary health institution.

## Patients and methods

Participants consisted of mothers/caregivers with their under-5 children presenting to various clinics and wards of the Paediatric Department of the University of Nigeria Teaching Hospital (UNTH), Enugu, between October 2006 and February

2007. These months mark the late part of the rainy season and correspond with the peak of seasonal diarrhoeal illnesses.

Children with diarrhoeal illnesses are managed in the Diarrhoea Therapy Unit (DTU), part of the children's emergency unit and solely dedicated to management of diarrhoeal illnesses and education of caregivers. Patients with vomiting and diarrhoea with or without other symptoms were recruited at the time of presentation to hospital. Information from consenting participants was obtained using a structured questionnaire and included duration of illness, whether ORT solution was given, the perceived cause of the diarrhoea, and use of antibacterial and antidiarrhoeal drugs. We obtained drug names from caregivers who were able to provide them, and where they could not easily be provided we asked for any left-over drugs that had not yet been given to the child to be brought to the hospital so that we could confirm the names.

One focus of this study was the caregivers' understanding of the treatments they had administered to the children. What we refer to as antimotility drugs includes both drugs that are scientifically recognised as such and those that caregivers perceived to work as such and gave children to stop diarrhoea. Children who had been seen in other peripheral health institutions and later referred to UNTH were excluded because we intended to evaluate only the practice of caregivers at home before presentation to hospital.

Personal data and other determinants of socio-economic status (SES) were obtained from the respondents. SES was assigned as upper, middle or lower using the classification proposed by Olusanya *et al.*<sup>11</sup> Data are presented in tabular form, using percentages, the chi-square test and a level of significance of 0.05 using the Statistical Package for Social Sciences (SPSS) version 11.5.

## Results

Two hundred and fifty children aged under 5 with complaints of vomiting and diarrhoea were brought to the UNTH by their caregivers during the study period. Of these 156 met the inclusion criteria and were recruited. The majority of the caregivers (84/156, 53.8%) had tertiary education, while 52 (33.3%) had secondary school education and the remainder (20, 12.8%) less than secondary level education. Most caregivers (76, 48.7%) were of middle SES, followed by upper and lower SES (30.8% and 20.5%, respectively).

There were 88 (56.4%) male and 68 (43.6%) female children in the study. The majority were infants aged 0 - 11 months (106, 67.9%) followed by 12 - 24-month-olds (46, 29.5%); only a few children were 25 - 59 months old (4, 2.6%).

Most children presented by day 3 after the onset of diarrhoea. The mean duration of illness before presentation was 4.35 days (standard deviation (SD) 3.4), with a range of 1 - 14 days, and there was no difference between the three socio-economic groups; significantly, however, more children in the younger age groups were brought to hospital earlier ( $p=0.019$ ).

Most mothers (82, 52.6%) believed that their children's problems were caused by teething (Fig. 1). This was not influenced by level of maternal education.

About half of the respondents had given antibacterial agents to their children before presenting to hospital. The most common drugs included metronidazole alone (47.5%), metronidazole plus other agent(s) (12.5%) and augmentin (10.0%) (Table I). Most of the drugs were obtained over the

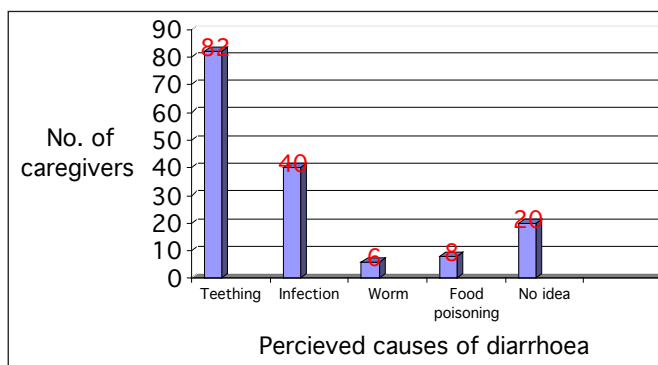


Fig. 1. Distribution of caregivers according to perceived causes of diarrhoea.

TABLE I. DISTRIBUTION OF ANTIBACTERIAL DRUGS USED BEFORE HOSPITAL PRESENTATION

Antibacterial drugs	Frequency (N)	%
Metronidazole*	48	60.0
Penicillins <sup>†</sup>	14	17.5
Co-trimoxazole	6	7.5
Cephalosporins	6	7.5
Others <sup>‡</sup>	6	7.5
Total	80	100.0

\*Metronidazole given alone or in combination with other drugs.  
<sup>†</sup>Penicillins include augmentin, amoxicillin and ampicillin.  
<sup>‡</sup>Others include tetracycline plus some miscellaneous agents.

counter, while others were left-over medicines from previous hospital visits. Of the respondents 44.9% (70) had given a treatment that they considered an 'antimotility' agent, with the intention of stopping the diarrhoea. Agents commonly used included metronidazole, which was considered to be an antimotility agent by as many as 60.0% (42/70), Diastop and Anti-diarrhoeal Mixture (Table II). Of note is that some of the caregivers had given both antibacterial and antidiarrhoeal drugs to their children. Level of education was not associated with any differences with regard to use of antibacterial and antidiarrhoeal agents (Table III). Likewise, higher SES did not seem to have a significant effect on use or non-use of these agents by caregivers (Table IV).

TABLE II. DISTRIBUTION OF DRUGS PERCEIVED AS 'ANTIMOTILITY DRUGS'\* USED BEFORE HOSPITAL PRESENTATION

Antimotility drug	Frequency (N)	%
Metronidazole	42	60.0
Diastop	12	17.1
Anti-diarrhoeal Mixture	6	8.6
Thalazole	6	8.6
Others	4	5.7
Total	70	100.0

\*Caregivers reported that they had used these drugs for their anticipated antimotility effects.

**TABLE III. RELATIONSHIP BETWEEN MATERNAL EDUCATIONAL LEVEL AND HOME TREATMENT WITH ANTIBACTERIAL AND ANTIDIARRHOEAL AGENTS**

Maternal educational level	Antibacterial used or not*			Antidiarrhoeal used or not <sup>†</sup>		
	Yes	No	Total	Yes	No	Total
Tertiary	38	46	84	32	52	84
Secondary	28	24	52	26	26	52
Below secondary	14	6	20	12	8	20
Total	80	76	156	70	86	156

\* $\chi^2=4.170$ ;  $df=2$ ;  $p=0.124$ .

<sup>†</sup> $\chi^2=3.936$ ;  $df=2$ ;  $p=0.138$

**TABLE IV. RELATIONSHIP BETWEEN SOCIO-ECONOMIC STATUS AND HOME TREATMENT WITH ANTIBACTERIAL AND ANTIDIARRHOEAL AGENTS**

SES	Antibacterial used or not*			Antidiarrhoeal used or not <sup>†</sup>		
	Yes	No	Total	Yes	No	Total
Upper	24	24	48	18	30	48
Middle	36	40	76	36	40	76
Lower	20	12	32	16	16	32
Total	80	76	156	70	86	156

\* $\chi^2=2.109$ ;  $df=2$ ;  $p=0.348$ .

<sup>†</sup> $\chi^2=1.586$ ;  $df=2$ ;  $p=0.452$ .

The perceived causes of diarrhoea did not seem to have any influence on the use or non-use of antibacterial and antidiarrhoeal drugs. Of the caregivers who believed their children's diarrhoea to be caused by teething, 39.0% (32/82) nevertheless used antibacterial agents, while only 55% (22/40) who thought it was caused by an infection administered antibacterial agents at home. Relating the various perceived causes to the use or non-use of antibacterial agents showed no statistically significant differences ( $p=0.379$ ). Similarly, perceived causes of diarrhoea and use of antidiarrhoeal agents did not differ significantly between those who used an antimotility agent and those who did not ( $p=0.185$ ).

There was a significant difference in duration of illness before presentation between caregivers who had used either antibacterial or antidiarrhoeal drugs at home compared with those who had not. The mean durations for those who had and had not used antibacterial agents were 5.06 (SD 3.9) and 3.59 (2.5) days, respectively ( $p=0.006$ , 95% confidence interval (CI) 0.42 - 2.52). For antidiarrhoeal drugs the mean durations for those who had used them compared with those who had not were 4.77 (SD 3.4) and 4.00 (3.36) days, respectively ( $p=0.159$ , 95% CI -0.31 - 1.85).

Home use of antibacterial and antidiarrhoeal agents was significantly associated with hydration status of the children at presentation (Table V). Patients who had received home treatment with antibacterial and antidiarrhoeal drugs presented with more severe dehydration than children who had not been managed with these agents. This is an important finding when taken together with the differences in the duration of illness before presentation between these two groups of patients.

Only 73.0% (114/156) of caregivers had started ORT fluids before bringing the child to hospital. Of the 80 caregivers

who commenced antibacterial agents at home, 66 (82.5%) had also used ORT fluids and 14 (17.5%) had not, while 62 of 70 caregivers (88.6%) who had used antidiarrhoeal drugs had also used ORT fluids (some caregivers gave both antibacterial and antidiarrhoeal drugs). There was a significant association between administration of drugs at home and commencement of ORT fluids. Women who had given antibacterial agents were more likely to have started ORT fluids ( $p=0.006$ ) than those who had not, and similarly more of those who had given antimotility drugs had started ORT fluids at home ( $p<0.001$ ). However, 66 of these 114 caregivers (57.9%) did not prepare the ORT fluids appropriately in terms of the volume of water used in relation to the amount of salt.

## Discussion

Although antibacterial agents have no proven usefulness in the management of acute watery diarrhoea, many caregivers continue to use them extensively, as was seen among our study participants. Most acute cases of gastro-enteritis are caused by viruses and only ORT is needed.<sup>1,12</sup> Even when a bacterial cause is suspected in an outpatient setting, antimicrobial therapy is not usually indicated in children because the majority of cases of acute diarrhoea are self-limited and not shortened by antimicrobial agents.<sup>1</sup> The World Health Organization (WHO) has reported that rotavirus is the commonest cause of diarrhoea in children, with 95% worldwide being infected irrespective of race or SES within the first 3 - 5 years of life. Even in hospital-based surveys rotavirus is responsible for 25 - 65% of severe dehydrating diarrhoea.<sup>12</sup>

Similar to other reports,<sup>13,14</sup> higher parental education and SES did not seem to have a positive impact on use of antibacterial agents before presentation at hospital, and a large proportion

TABLE V. RELATIONSHIP BETWEEN HOME TREATMENT WITH ANTIBACTERIAL AND ANTIDIARRHOEAL AGENTS AND HYDRATION STATUS OF CHILDREN AT PRESENTATION

	Hydration status			Total
	No dehydration	Moderate dehydration	Severe dehydration	
<b>Antibacterial agent used or not*</b>				
Yes	30	46	4	80
No	56	14	6	76
Total	86	60	10	156
<b>Antidiarrhoeal agent used or not†</b>				
Yes	28	36	6	70
No	58	24	4	86
Total	86	60	10	156

\* $\chi^2=25.241$ ;  $df=2$ ;  $p<0.001$ .  
† $\chi^2 = 11.748$ ;  $df = 2$ ;  $p=0.003$ .

of the children in our study were treated with two or more antibiotics. This is of great concern in that a higher level of maternal education is thought to be associated with better child care practices. This deviation emphasises the need for proper monitoring of child care practices across all strata of society.

Indiscriminate use of antibiotics results in unnecessarily increased expense and also development of resistance.<sup>15</sup> Addition of 'harmless' but unnecessary drugs under pressure from business shifts the emphasis from the standard management of acute childhood diarrhoea (oral rehydration solution, feeding and zinc supplementation).<sup>1,15</sup> Nonspecific antidiarrhoeal agents (e.g. adsorbents such as kaolin-pectin), antimotility agents (e.g. loperamide), antisecretory drugs and toxin binders (e.g. cholestyramine) are commonly used by older children and adults, but data are limited regarding their efficacy. Side-effects of these drugs are well known, in particular those of the antimotility agents, including opiate-induced ileus, drowsiness, and nausea caused by the atropine effects and binding of nutrients and other drugs.<sup>16-18</sup>

Caregivers appear to want to administer some form of 'drug' to their children irrespective of its indication. In our study, even among those who believed their child's diarrhoea were caused by non-infectious factors such as teething, a significantly high proportion still used antibacterial agents at home, e.g. metronidazole was used as an antimotility agent without the caregiver being aware that it is an antibiotic. This abuse of

antibiotics should be discouraged, as it increases development of multidrug-resistant strains.<sup>19,20</sup> The relatively low cost of metronidazole and its easy access over the counter, coupled with the fact that it has minimal side-effects, presumably make it seem an attractive proposition to caregivers. Another commonly abused drug is co-trimoxazole, which has recently shown markedly reduced activity against common organisms for which it was an antibiotic of choice, such as *Shigella*. In the most recent WHO guideline for management of dysentery, co-trimoxazole and nalidixic acid have been replaced by the fluoroquinolones as the first-line drugs.<sup>21</sup> It has been suggested that the recent introduction of zinc supplements in the management of diarrhoea is particularly beneficial because it does not only shorten duration of diarrhoeal episodes<sup>22</sup> but may also satisfy the psychological needs of mothers who believe they 'must' administer drugs for the effective management of acute watery diarrhoea.<sup>1</sup>

An interesting finding in our study population was the fact that caregivers who gave antibacterial and antidiarrhoeal drugs to their children at home brought the children to hospital later than those who did not. This may suggest a tendency to rely on use of these agents for children's illnesses, potentially resulting in late presentation to health facilities and an increased risk of complications. However, we recognise that a patient's condition at presentation to hospital depends on a number of factors other than the length of time that has elapsed before hospitalisation, including the intrinsic severity of the disease itself. It is also possible that some of our patients may have had other underlying diseases. We focused principally on the state of the children at the point of presentation and did not look at their clinical course in hospital. Data on the outcome of hospital management may have helped clarify disease severity and co-morbidity.

Although more women who gave drugs to their children at home also used ORT fluids compared with those who did not give drugs, the former group of children had more severe degrees of dehydration. Possible reasons for this finding include a further delay in presentation among those who were providing home treatment for their children and the fact that most of the ORT fluids administered were incorrectly

### Zinc supplementation

improves outcome in acute diarrhoea and may also satisfy caregivers' desire to give 'medicine'.



reconstituted. Again this emphasises the need for proper education on the home management of diarrhoea and prompt medical attention if symptoms get worse despite efforts to manage the illness at home.

The fact that not all the caregivers who had started antibacterial agents and/or antidiarrhoeal drugs at home administered any form of ORT fluids to their children before presentation at hospital may suggest that some mothers have more faith in drugs than ORT in spite of the latter's scientifically proven benefits in the management of diarrhoea and prevention of life-threatening complications. Furthermore, the fact that many of the ORT fluid preparations were not properly reconstituted may explain why the drug-treated group had more severe dehydration. Administering inappropriately made up ORT fluids may cause hypernatraemia or hyponatraemia. This finding stresses the need for health workers involved in the care of children should try both to obtain a detailed history from caregivers and to seek every possible opportunity to educate them.

Limitations to this study include the fact that tertiary health institutions are likely to see children with more severe disease. However, the study represents assessment of caregivers in our catchment area and has implications for practice.

In conclusion, in our study population management of acute diarrhoea in the home is characterised by unnecessary use of antibiotics and antidiarrhoeal agents. These should be discouraged, while zinc supplements should be popularised. Intermittent public health campaigns and health care worker updates on the use of ORT/zinc supplements are vitally necessary. Zinc supplementation improves outcome in acute diarrhoea and may also satisfy caregivers' desire to give 'medicine', while at the same time reducing the abuse of antibiotics and the associated cost and drug resistance.

## References

1. Alam S, Bhatnagar S. Current status of anti-diarrheal and anti-secretory drugs in the management of acute childhood diarrhoea. *Indian J Pediatr* 2006; 73: 693-696.
2. King CK, Glass R, Bresee JS, Duggan C. Managing acute gastroenteritis among children - oral rehydration, maintenance, and nutritional therapy. *MMWR Recomm Rep* 2003; 52(RR16): 1-16. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5216al.htm> (accessed 4 September 2007).
3. Parashar U, Hummelman E, Bresee J, Miller M, Glass R. Global illness and deaths caused by rotavirus disease in children. *Emerg Infect Dis* 2003; 9: 565-572.
4. Black RE, Morris SS, Bryce J. Where and why are 10 million children dying every year? *Lancet* 2003; 361: 2226-2234.
5. Kosek M, Bern C, Guerrant RL. The global burden of diarrhoeal disease, as estimated from studies published between 1992 and 2000. *Bull World Health Organ* 2003; 81:197-204.
6. Claeson M, Merson MH. Global progress in the control of diarrhoeal diseases. *Pediatr Infect Dis J* 1990; 9: 345-355.
7. UNICEF - Progress for Children 2007: Diarrhoeal diseases at: [http://www.unicef.org/progressforchildren/2007n6/index\\_41805.htm](http://www.unicef.org/progressforchildren/2007n6/index_41805.htm) (accessed 27 December 2007).
8. Gibbons E, Dobie SA, Krieger J. Evaluation of oral rehydration therapy in Matiguas, Nicaragua. *Public Health Rep* 1994; 109(3): 428-433.
9. Alam NH, Ashraf H, Khan WA, Karim MM, Fuchs GJ. Efficacy and tolerability of racecadotril in the treatment of cholera in adults: A double blind, randomized, controlled clinical trial. *Gut* 2003; 52: 1419-1423.
10. Wang H-H, Shieh M-J, Liao K-F. A blind, randomized comparison of racecadotril and loperamide for stopping acute diarrhea in adults. *World J Gastroenterol* 2005; 11(10): 1540-1543.
11. Olusanya O, Okpere E, Ezimokhai M. The importance of social class in voluntary fertility control in a developing country. *West Afr Med J* 1985; 4: 205-212.
12. Cunliffe NA, Kilgore PE, Bresee JS, et al. Epidemiology of rotavirus diarrhoea in Africa: a review to assess the need for rotavirus immunization. *WHO Bulletin OMS* 1998; 75(5): 525-537.
13. Karande S, Sankhe P, Kulkarni M. Patterns of prescription and drug dispensing. *Indian J Pediatr* 2005; 72: 117-121.
14. Okeke TA, Okafor HU, Amah AC, Onwasigwe CN, Ndu AC. Knowledge, attitude, practice, and prescribing pattern of oral rehydration therapy among private practitioners in Nigeria. *J Diarrhoeal Dis Res* 1996; 14: 33-36.
15. Bruneton C, Maritoux J, Topuz B. Analysis of information to the attention of prescribers and patients concerning the treatment of diarrhoea in children in France. WHO Essential Medicines and Policy Department (EDM) International Conferences on Improving Use of Medicines (ICIUM). <http://www.icium.org/index.htm> (accessed 27 December 2007).
16. Bhutta TI, Tahir KI. Loperamide poisoning in children. *Lancet* 1990; 335: 363.
17. Pickering LK, Feldman S, Ericsson CD, Cleary TG. Absorption of salicylate and bismuth from a bismuth subsalicylate-containing compound (Pepto-Bismol). *J Pediatr* 1981; 99: 654-656.
18. Gorbach SL. Bismuth therapy in gastrointestinal diseases. *Gastroenterology* 1990; 99: 863-875.
19. Sur D, Niyogi SK, Sur S, et al. Multidrug-resistant *Shigella dysenteriae* type 1: forerunners of a new epidemic strain in eastern India. *J Emerg Infect Dis* 2003; 9: 404-405.
20. Sarkar K, Ghosh S, Niyogi SK, Bhattacharya SK. *Shigella dysenteriae* type 1 with reduced susceptibility to fluoroquinolones. *Lancet* 2003; 361: 785.
21. World Health Organization. Guidelines for the control of shigellosis, including epidemics due to *Shigella dysenteriae* type 1. 2005. <http://whqlibdoc.who.int/publications/2005/9241592330.pdf> (accessed 10 October 2009).
22. Penny ME, Peerson JM, Marin RM, et al. Randomized, community-based trial of the effect of zinc supplementation, with and without other micronutrients, on the duration of persistent childhood diarrhea in Lima, Peru. *J Pediatr* 1999; 135(2 Pt 1): 208-217.