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SHORT REPORT: PRESCRIPTION AND ADMINISTRATION OF A 14-DAY REGIMEN OF ZINC TREATMENT FOR CHILDHOOD DIARRHEA IN MALI

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Abstract. We evaluated prescription and correct dosing of a 14-day course of dispersible zinc tablets prescribed to young children with diarrhea by community and facility workers in rural, southern Mali, West Africa. One hundred twenty-three children were followed at home on days 3 and 14 after being prescribed zinc. The age-appropriate dose of zinc was dispensed in 94% of cases. Ninety-five percent of mothers dissolved the tablet in a small amount of water and gave it with a spoon. Only eight caretakers reported problems with zinc administration: either vomiting or refusal to take the tablets. Sixty-four percent of children received the full 14-day course of treatment, and more than 89% of children were given at least a 10-day course of zinc treatment. The levels of correct administration were very good but might be lower under non-research conditions.

Diarrhea accounts for an estimated 18% of childhood deaths worldwide.[1] Zinc treatment given for 10–14 days during and after the diarrheal episode is associated with reductions in severity and duration, all-cause less than 5-year mortality, and incidence of diarrheal cases in the months after zinc treatment.[2–4] World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) now recommend a 10- to 14-day course of zinc treatment in addition to oral rehydration salts (ORS) for the treatment of acute childhood diarrhea.[5]

Administration of medications for childhood illness is generally less than adequate.[6–8] Concerns have been raised regarding the 10- to 14-day course of zinc treatment, which is longer than most treatment regimens. Adherence with zinc treatment of diarrhea has not been previously reported for Africa. This report characterizes administration of zinc treatment in the home in a small-scale pilot study examining operational issues associated with introduction of this new treatment.

As part of the pilot phase of a multi-center study examining the operational impacts of zinc introduction in Pakistan, India, and Mali health centers and drug kits managed by community health workers (CHWs) provided zinc to children presenting with diarrhea in two health zones in Bougouni District, southern Mali.[9] The project trained health center staff and CHWs in 1) diarrhea case management with zinc and ORS, 2) counseling of parents on child feeding and diarrhea prevention and treatment, and 3) recording routine data in notebooks. The recommended 14-day course of zinc treatment is one 20-mg dispersible tablet per day for children of age 6 months or older and 10 mg/d (one half a tablet) for children less than 6 months. Labels attached to the 14-count blister packages provided pictorial and written instructions in Bambara, the local language, on zinc administration. A key message was "give the child with diarrhea one tablet a day for 14 days, even if the diarrhea stops." Pictorial and written instructions for children less than 6 months instructed parents to cut the tablet in half and administer ½ tablet to the child each day; the age-specific, labeled, blister packets are shown in Figure 1. The cost of zinc to patients was 100 francs cfa (~0.19 USD) for the full blister package and 50 francs cfa (~0.09 USD) for ½ of the blister package (for children less than 6 months of age).

Interviewers employed by the project, but not involved in the implementation of the intervention, conducted follow-up interviews with all children prescribed zinc from health centers or CHWs in the home on days 3 and 14 after the consultation over a period of 8 weeks in June-August 2004. The home follow-up examined 1) timing and manner of zinc administration, 2) purchasing patterns, 3) other medications administered, 4) problems in administering the tablets, and 5) adverse outcomes or side effects. Interviewers asked to see the blister packages of zinc to verify the reported information.

To document reactions to the new treatment and patterns of drug administration, we conducted semi-structured qualitative interviews with 37 caretakers of young children: 28 that had used zinc treatment and 9 that had not, as well as 18 CHWs and 2 health facility nurses.

The minimum dose of zinc treatment was defined as 10 or more days of the same dose of treatment, which is the minimum recommended by the WHO.[10] Analysis was carried out in SPSS 11.0[11] and Stata Version 7.[12]

The study received ethical approval from Johns Hopkins University Bloomberg School of Public Health Committee for Human Research and the University of Bamako Faculty of Medicine, Pharmacy, and Dentistry Internal Review Board. Consent in each participating village was obtained from village leaders, and parents were asked for consent before interviews.

A total of 123 children who received zinc, 21 at health centers and 102 from CHWs, were followed-up in their homes. Almost one half the children (47%) were 12–23 months of age, with younger children more frequently visiting the health facility (Table 1). Two children died between the day 3 and 14 visits. Verbal autopsy interviews, which investigated the causes of death and the actions taken before the child's deaths, were conducted with caretakers and identified no connection with zinc administration. Parents reported that their children had diarrhea for an average of 3.2 days (95% confidence interval = 2.6, 3.8) before presenting for care to the health center or CHW. The majority of caretakers re-

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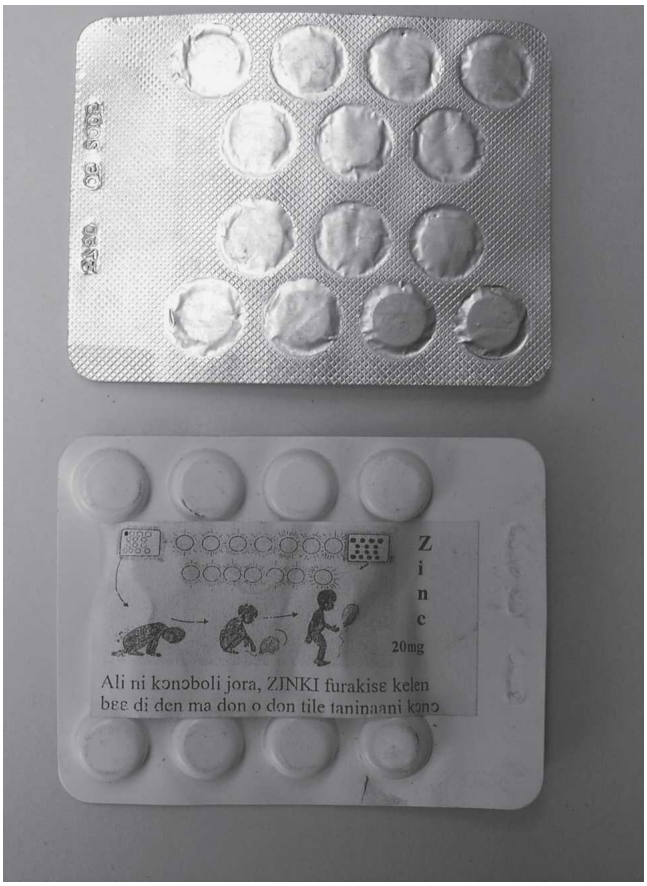

FIGURE 1. Example of age-specific, labeled blister packages of zinc.

ported that their children had symptoms in addition to diarrhea, most commonly fever and vomiting. Table 1 presents characteristics of the illness episodes reported by parents.

The correct dose of zinc for the child's age was prescribed and sold by health center staff and CHWs in the majority of cases, based on interviews with parents (Table 2). More than 90% of caretakers reported that CHWs and health center staff sufficiently explained the quantity of zinc needed, duration of treatment, and alternatives for administering the tablets (directly, by or dissolving them in water or breast milk). Fewer than 25% of caretakers reported that they received information about danger signs requiring referral to a health center. Health facility staff and CHWs showed adequate knowledge of treatment and counseling guidelines in semi-structured interviews.

Qualitative research both before and during the pilot test indicated some parents thought the dispersible tablets were too large to give to a small child and that it was better to give children syrups. In the training of health workers, it was stated that parents could administer the zinc by dissolving in a few drops of water or breast milk on a spoon. The majority of caretakers (95%) dissolved the zinc tablet in a small amount of water and gave it the child in a spoon, 4% of caretakers dissolved it in a few drops of breast milk and gave it in a spoon, and only 1% (one caretaker) reported putting the zinc tablet directly in the child's mouth. Eight caretakers (6.5%) reported problems with administering the zinc to their child; five (4%) caretakers reported vomiting; and three (2.5%) caretakers reported that the child refused the tablets.

Adherence to the full 14-day regimen was high, and dosing was generally appropriate (Table 2). About two thirds of children received the dose of zinc exactly as recommended for 14 days. In addition, 89% of children followed received at least 10 days of zinc treatment. Those cases who only received the minimum dose rather than the recommended quantity either stopped administering zinc on day 12 or 13 or skipped 1–2 days during the 2-week period. One child under 6 months was prescribed and received a full tablet (20 mg) per day instead of the recommended one half of a tablet (10 mg). Children that did not receive the minimum treatment either had their treatment stopped after a few days or were children over 6 months who received only one half of a tablet per day. The rate of correct prescription and levels of administration of the zinc treatment did not differ greatly by source of prescription (Figure 2).

Community reaction to the zinc treatment was very favorable. Parents expressed appreciation for the clean and appealing appearance of the packaging and tablets. Some parents felt the packages too closely resembled paracetamol available in local markets. Most parents reacted very positively to the effect of the zinc treatment, stating that their child's diarrhea was resolved in only a few days after purchasing the zinc. Parents particularly noted the increase in the child's appetite and the return of normal activity levels. For example, one mother stated:

TABLE 1
Reported characteristics of children prescribed zinc

	Children presenting to health center (n = 21)	Children presenting to CHW (n = 102)	All children (n = 123)
Age of child			
0–5 months	1 (4.8%)	7 (6.8%)	8 (6.5%)
6–11 months	11 (52.4%)	23 (22.6%)	34 (27.6%)
12–23 months	6 (28.6%)	52 (51.0%)	58 (47.2%)
24–60 months	3 (14.3%)	20 (19.6%)	23 (18.7%)
Average duration of diarrhea before seeking care (in days)	2.9 (SD = 1.7)	3.3 (SD = 3.7)	3.2 (SD = 3.4)
Additional symptoms reported in children			
Fever	12 (57.1)	57 (55.8)	69 (56.1)
Vomiting	13 (61.9)	41 (40.2)	54 (43.9)
Lack of appetite	7 (33.3)	20 (19.6)	27 (22.0)
Cough	3 (14.3)	14 (13.7)	17 (13.8)
Sunken fontanel	0	8 (7.4)	8 (6.5)

TABLE 2
Reported prescription and administration of a 14-day course of zinc treatment in the home during the pilot study

	Children 0~5 months	Children 6–60 months	All children
Prescription of zinc by health worker	$n = 8$	$n = 115$	$n = 123$
Correct dose	7 (87.5%)	109 (94.8%)	116 (94.3%)
Incorrect dose	1* (12.5%)	6† (5.2%)	7 (5.7%)
Administration of zinc in the home	$n = 8$	$n = 113$	$n = 121$
As recommended (14 days)	6 (75%)	71 (62.8%)	77 (63.6%)
Minimum dose (at least 10 days)	8 (100%)	100 (88.5%)	108 (89.3%)

* One child given 14 tablets by village health worker.
† Two children given 7 tablets at health center; three children given 7 tablets and one child given 28 tablets by village health worker.

"Before I gave the zinc to my child, he could not go 2 weeks without having diarrhea. Every time I gave him the medications, the diarrhea would stop for a few days and then start again. But with the zinc it was different, the child took the zinc and he is relieved….he plays a lot as you can see, he eats, and breast feeds without stopping."

In summary, most children received the minimum recommended dose of zinc, despite the long duration of the dosing schedule, acceptance of the new treatment was high, and few side effects were noted. Blister packs likely facilitated correct prescription and administration, as has been seen in previous studies,[9,13–20] although no conclusions can be drawn from our study design. It is possible that the levels of correct prescription, counseling, and administration we observed are higher than those expected a typical program context. Although this study aimed to characterize administration under routine program conditions, zinc was a newly introduced treatment under conditions of closer-than-usual observation. Interviewers visiting households for follow-up could also have increased the level of compliance, especially if families were expecting a visit on the 14th day and suspected the interviewer would examine the blister package.

Most children received at least 10 days of treatment in our study. This is very promising for the expected public health impact of the introduction of zinc treatment of childhood diarrhea. Significant benefits from zinc treatment of diarrhea have been reported in Bangladesh even when children receive a mean of 7 days of treatment.[2] However, many fewer children were administered zinc for 14 days (all the tablets in the blister package). It is likely that, similar to our observations, caretakers might give fewer than the 10 tablets contained in the commercially available blister package, resulting in fewer children receiving the minimum recommended dose. The 10-day treatment regimen should be introduced with approaches to ensure high levels of compliance, such as inclusion of locally appropriate dosing instructions and communication of clear counseling messages by health workers; levels of correct administration should also be evaluated for this dosing regimen.

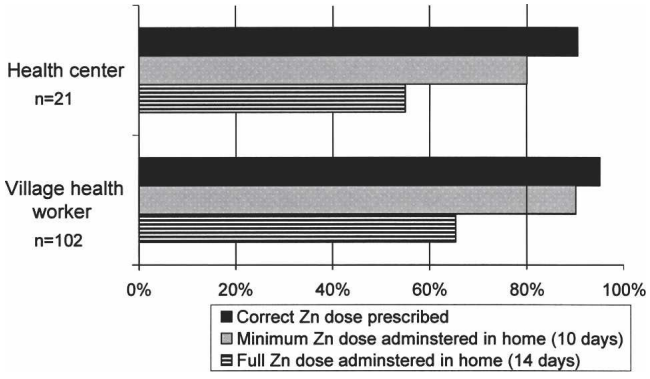

FIGURE 2. Rates of correct prescription and administration of zinc treatment prescribed by health centers and village health workers.

This study did not examine factors affecting administration of zinc such as who purchases the zinc, counseling received from the health care provider, educational level of the parents, concomitant symptoms and medications, and side effects such as vomiting. The next phase of research will examine these aspects in more depth.

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