Evaluation of a novel water treatment and storage intenvention in Nicaragua

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The cholera epidemic in Latin America has spotlighted inadequate water quality and sanitation in the Region. The long-term solution to this problem would be for every community to have piped, disinfected water as well as sewage treatment facilities, but sufficient resources to provide such services do not exist. An alternative strategy for improving water quality shows promise. This strategy has three parts: [1] point-of-use water treatment with sodium hypochlorite solution produced locally with appropriate technology;[2] safe water storage in special, narrow-mouthed water storage vessels; and [3] community education [1]. A field trial in El Alto, Bolivia, showed that a community of Aymara Indians using this intervention was able to produce drinking water that met WHO guidelines for microbiologic water quality [2]. In a second trial in Montero, Bolivia, a group of households using the intervention had 44 % fewer episodes of diarrhea than did neighboring control households [3]. To evaluate this strategy in Central America, we tested a similar intervention in Asedades, Nicaragua, a poor , rural community of approximately 1100 persons, between January and April 1996.

A convenience sample of 100 households was selected to receive the intervention, which consisted of an 80-liter plastic, lidded storage vessel equipped with a spigot for extracting water (referred to as the "special vessel"); sodium hypochlorite solution produced in the neighboring town of Boaco, Nicaragua, using a Dip Cell hypochlorite generator (Magneto-Chemie, Ltd., Holland); and community education. Between 8 and 11 January 1996, the community received education about diarrheal disease prevention and proper use of the intervention materials. From 11 to 17 January 1996, we conducted a baseline survey of demographic characteristics and water-handling practices of each participating household. In mid January, the community formed a "water committee" composed of eight persons responsible for reinforcing the educational messages and helping resolve problems in the use of the intervention materials. Then the vessels and hypochlorite solunon were distributed. Participants were instructed to put 10 mL of disinfectant in the vessels each time they filled them. From 15 to 19 April 1996, we conducted follow-up surveys in all homes that received the interventionl checking chlorine residuals in water in the special vessels using the DPD colorimetric method (Hach Co., Loveland, Colorado).

The median age of the survey respondents was 40 years (range 14 to 80), and 83% were female. Among the 100 persons surveyed , 45 had no formal education, 53 had from 1 to 6 years of schooling, and 2 could not provide that information. Overall, 642 persons lived in the 100 households surveyed, for a median household size of 6 (range 1 to 13). Household water sources included covered wells with rope-pumps (61 %), a river (26%), a spring (10%), or a combination of sources (3%). Of the 96
respondents who stored drinking water in their homes, 68 (71%) used 20-liter wide-mouthed plastic buckets, 24 (25%) used wide-mouthed earthenware jars, and 4 (4%) used both. For water treatment, 68 % of respondents said they used chlorine when it was available, 5% said they put chlorine in their wells, and 26% said they

used nothing. At the time of the baseline survey, chlorine was not available in the community.

In the follow-up survey, all 100 respondants said that their household was using the special vessel. Ninety-nine percent of the vessels were observed to have water in them, 98% had lids in place, 100% had a functioning spigot, and 5% were observed to be dirty. Of the 98 water samples obtained, 51 (52%) had detectable free chlorine residuals, with a median residual of 0.4 mg/L (range 0.2 to 3.5). Fifty-four (55%) of the water samples had detectable total chlorine, with a median residual of 0.4 mg/L trange 0.2 to 3.5). Of 100 study participants, 85 could state the correct amount of hypochlorite disinfectant to add to the full water vessel. This study demonstrated that the majority of the population of Asedades complied with the use of this novel water intervention. Although neither microbiologic water quality nor diarrhea rates were measured in this study, results from the Bolivian studies [2,3] suggest that an improvement in both outcomes would have been likely in the Asedades population. Interventions of this type are inexpensive, simple, easy to implement, and have been shown to be acceptable to several different populations. They offer a promising alternative approach to improving water quality in the developing world and deserve further study.

References

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