

Uptake of household disinfection kits as an additional measure in response to a cholera outbreak in urban areas of Haiti

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ABSTRACT

Médecins Sans Frontières-Operational Centre Amsterdam piloted the distribution of household disinfection kits (HDKs) and health promotion sessions for cholera prevention in households of patients admitted to their cholera treatment centres in Carrefour, Port au Prince, Haiti, between December 2010 and February 2011. We conducted a follow-up survey with 208 recipient households to determine the uptake and use of the kits and understanding of the health promotion messages. In 61% of surveyed households, a caregiver had been the recipient of the HDK and 57.7% of households had received the HDKs after the discharge of the patient. Among surveyed households, 97.6% stated they had used the contents of the HDK after receiving it, with 75% of these reporting using five or more items, with the two most popular items being chlorine and soap. A significant ($p < 0.05$) increase in self-reported use items in the HDK was observed in households that received kits after 24 January 2011 when the education messages were strengthened. To our knowledge, this is the first time it has been demonstrated that during a large-scale cholera outbreak, the distribution of simple kits, with readily available cleaning products and materials, combined with health promotion is easy, feasible, and valued by the target population.

Key words | cholera, disinfection, Haiti, households, outbreaks, prevention and control

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INTRODUCTION

Cholera is caused by an infection with the bacterium *Vibrio cholerae* and can cause severe acute watery diarrhoea in infected persons. The disease is highly transmissible between persons in any context. Risk factors for infection in humans have been identified in various epidemic settings and include household contact with another diarrhoea case (Kone-Coulibaly *et al.* 2010; Siddiqui *et al.* 2006), lack of use of soap when washing hands (Mahamud *et al.* 2012), limited hygiene practices, eating contaminated food and drinking water from non-chlorinated sources (Kone-Coulibaly *et al.* 2010; O'Connor *et al.* 2011).

Successful prevention and control measures during outbreaks have included the following components: (1) appropriate clinical case management; (2) access to safe

drinking water; (3) improved sanitary and hygiene conditions; (4) infection control strategies in health facilities and homes of cholera patients to reduce person-to-person transmission; (5) health education particularly targeted at practices related to increasing hand washing with soap and preparation of safe food (WHO 1993; MSF 2004; Lamond & Kinyanjui 2012).

Disinfection practices at the household level, such as spraying household walls and surfaces with chlorine solution, have been used in previous cholera outbreaks. However, there is scarce evidence to support this measure as a means to interrupt household level cholera transmission. Increasingly, the use of household disinfection kits (HDKs) is being promoted to encourage an increased

level of hygiene at the household level where cholera cases are identified, as well as promoting individual responsibility in cholera prevention (DINEPA 2010; Lamond & Kinyanjui 2012). Such kits include materials and cleaning products that would allow a household to continuously disinfect their household items and to improve hand-washing practices in order to reduce transmission of cholera to other household members, as well as an instruction brochure.

In October 2010, a nationwide cholera epidemic started in Haiti. Within six months of declaration of the outbreak, more than 250,000 cases and 4,000 deaths from the disease were reported by the Ministry of Health (Dowell & Braden 2011). This outbreak followed a devastating earthquake in January 2010 in which much of the infrastructure (including water and sanitation) in the main cities was destroyed.

In order to have an immediate impact on the transmission of cholera at household level, Médecins Sans Frontières-Operational Centre Amsterdam (MSF) distributed HDKs to patients admitted to their cholera treatment centres (CTCs) in Haiti as part of the cholera treatment and prevention services. This component of the intervention was recommended by the National Directorate for Water Supply and Sanitation in the Ministry of Public Works (DINEPA 2010) and piloted in the Carrefour CTC between December 2010 and February 2011. The pilot's objective was to gain experience and understanding of the feasibility and acceptability of this alternative cholera prevention strategy in the context of a widescale epidemic and outbreak response operation. In order to document and improve the uptake and use of the kits by their recipients, as well as the impact of the simultaneous health promotion activities, we designed and implemented a follow-up survey with recipients of the HDKs and report on the findings here. We hope that the outcome of the pilot HDK distribution and the findings of the survey will assist in optimising and improving the roll-out of HDK distributions during future cholera outbreak responses.

METHODS

Context

Carrefour is a commune in the capital of Haiti, Port au Prince. It has a population of 373,916 (Haiti MoF 2003).

In response to the cholera outbreak declaration in October 2010, MSF established a CTC in this commune.

HDK content and distribution strategy

For the pilot HDK programme, between 27 December 2010 and 27 February 2011, MSF distributed vouchers to each newly admitted cholera patient via their caregivers in the Carrefour CTC. Caregivers were instructed to use the vouchers to receive an HDK immediately, and were encouraged to do so in order to implement its use within the affected households as soon as possible. In the case that no caregiver was present, patients were advised to collect the HDK upon discharge from the CTC.

The HDKs contained the following items: one 14-L bucket, one scrubbing brush, one cloth, 3.8 L of household bleach (chlorine), one 10-L jerry can, 500 g to 1 kg of soap (dependent on the variable local supply of soap in Port au Prince during the intervention) and one instruction brochure. The instruction brochure described, through pictograms and simple language, how to prepare a 0.05% chlorine solution for cleaning plates, dishes and utensils, and how to prepare a 0.2% chlorine solution for the cleaning and disinfection of floors, surfaces, latrines and clothes, and further, how to use the soap for washing hands after using the toilet, before eating, before preparing food for others and to wash with. Finally, the instructions encouraged persons to share this information with family and friends, but more importantly, to seek health care as soon as any signs of cholera appeared in themselves or their family members. Complete kits, at the time of the intervention, cost approximately 14 US Dollars.

Prior to receiving the kit, recipients were given a 30–40 minute group health promotion session in which the disease cholera was explained, including how it was transmitted, how the disinfection kit could be used to minimise transmission within the household and that its use needed to start as soon as possible after receiving the kit. On 24 January 2011, the communicated messages were strengthened based on a preliminary analysis of the survey results. The revised health promotion messages focused on: using all items in the HDK in conjunction with each other, using the items as soon as possible, sharing information and items in the kit with family, friends and neighbours.

Sample size

We sampled 200 households sequentially for this survey; this number was not based on an expected proportion of households that would use the HDKs, but was deemed feasible within the constraints of an ongoing (and busy) cholera outbreak intervention. All new cholera patients or their caregivers who received household disinfection kits in the Carrefour CTC from 18 January 2011 onwards were eligible for the follow-up visit. Recipients were asked if they would agree to participate in a follow-up visit after the reception of the kits. Exclusion criteria for follow up visits were persons that were not living within the boundaries of the Carrefour CTC catchment area. The survey ended on 12 February 2011, as this was the day when the 200-household sample had been completed.

Questionnaire

We developed a semi-structured questionnaire to be used as the survey tool. This tool included questions on the demography of the respondent, who in the household had received the disinfection kit, and what their use, frequency of use and overall perception of the kit was. The questionnaire was pilot tested among the MSF staff and field team prior to implementation.

Household follow-up visits and survey

Patients and caregivers that collected their HDK were entered into a register. This register was updated on a daily basis, and households that had agreed to have a follow-up visit were clearly indicated. Nineteen outreach workers (of whom one was the team leader) were trained on interviewing techniques and the questionnaire used in the survey. The outreach workers were divided between the ten zones of Carrefour commune for data collection purposes. Each day, for the duration of the survey, outreach workers selected households sequentially from an updated list of persons in their zone who had redeemed their HDK voucher at Carrefour CTC. In each household, the person responsible for using the kit was asked to answer. In the event that the house was empty on the first visit, outreach workers would return at a later stage to administer the

questionnaire. All persons were able to refuse participation in the survey when visited.

Data entry and analysis

Questionnaires were anonymised at the time of survey and therefore no personal information was present at the time of data entry. Data entry was done by the survey supervisor using a pre-coded Excel database. Data analysis was done with Excel by both the supervisor and the outbreak epidemiologist simultaneously.

RESULTS

Between 27 December 2010 and 29 February 2011, 1,884 patients with suspected cholera were admitted to the Carrefour CTC and four deaths (case fatality rate = 0.21%) were reported. During this period, 1,220 HDKs were claimed at the Carrefour CTC (64.8% of all cases admitted for treatment in this period).

A total of 208 households were visited as part of the follow-up survey. The majority of the respondents in the visited households were male ($n = 110$, 53%) and older than 16 years of age ($n = 149$, 72%). For 61% of the interviewed households, a caregiver had been the recipient of the HDK; the remaining 39% were the cholera patients themselves who had received the kits. The majority of HDK recipients received them after the time of discharge of the patient ($n = 120$, 57.7%). Seventy-nine patients (38.0%) received the kits at the time of discharge of the patient: five patients received the HDK during their stay; two of HDK recipients received the kits at the time of patient admission to the CTC; and lastly, for two recipients, information about the time when HDKs were issued was missing.

Of the 208 visited households, 203 (97.6%) stated that they had already used the contents of the HDK at the time of survey. These households were included in the remainder of the analysis. Approximately half of surveyed households ($n = 95$, 46.8%) had been using the HDK for 3 days or less at the time of the survey. The majority (more than 75%) of surveyed households reported using five or more items, with the two most popular items being chlorine and soap

Table 1 | Self-reported use of items contained in the HDK ($n = 203$)

	Item	Before 24 January	After 24 January	Total	<i>p</i> -value
		No. (%)	No. (%)	No. (%)	
By item	Soap	65 (98.5)	137 (100)	202 (99.5)	0.15
	Chlorine	64 (97.0)	136 (99.3)	200 (98.5)	0.20
	Cleaning cloth	50 (75.8)	120 (87.6)	170 (83.8)	0.03
	Scrubbing brush	45 (68.2)	119 (86.9)	164 (80.8)	<0.01
	Jerry can	42 (63.6)	111 (81.0)	153 (75.4)	0.01
	Bucket	41 (62.1)	109 (79.6)	150 (73.9)	<0.01
By number of items	Six	26 (39.4)	78 (56.9)	104 (51.2)	0.02
	Five	13 (19.7)	38 (27.7)	51 (25.1)	0.21
	Four	10 (15.2)	16 (11.7)	26 (12.8)	NA
	Three	12 (18.2)	1 (0.7)	13 (6.4)	NA
	Two	5 (7.6)	3 (2.2)	8 (3.9)	NA
	One	0 (0)	1 (0.7)	1 (0.5)	NA
Total households		66	137		

NA: not available.

(see Table 1). Of the households visited, 66 (32.5%) had received the HDKs before 24 January, after which health promotion messages were strengthened. A significant ($p < 0.05$) increase in self-reported use of the bucket, jerry can, cleaning cloth, scrubbing brush and all six items in the kit was observed in households that received kits after 24 January 2011 (Table 1). More than 70% of surveyed households had used the contents of the HDKs to clean the floors (Table 2). Cleaning and the disinfection of latrines, dishes and laundry using the contents of the kits were reported by approximately 60% of interviewed households. The cleaning and disinfection of sheets or other surfaces was reported by less than 51% of interviewed respondents (Table 2).

Table 2 | Self-reported items cleaned using the HDK ($n = 203$)

Item	Number (%)
Floors	148 (72.9)
Dishes	126 (62.1)
Laundry	123 (60.6)
Latrines	119 (58.6)
Sheets	102 (50.2)
Other surfaces	89 (43.8)

Ninety-four percent of respondents ($n = 191$) stated that the instructions for use of the disinfection kit were clear, and the same proportion (93.6%) felt that the procedures needed for disinfection were simple.

The majority of households reported having communicated with their family members about having received the kit ($n = 163$, 80.3%), and 43.8% ($n = 89$) had shared this information with friends and neighbours. With regards to sharing the contents of the kit, 54.7% of respondents had not shared any of the items with persons other than those in their household (Table 3). Around 30% of households surveyed had shared the contents of the kit with at least one group (family, neighbours or friends) and 17.2% with two or more groups (Table 3).

Table 3 | Self-reported sharing of items in the HDK ($n = 203$)

Item	Number (%)
None	110 (54.1)
Multiple	35 (17.2)
Family only	19 (9.4%)
Neighbours only	21 (9.4%)
Friends only	17 (8.4%)

DISCUSSION

The use of HDKs, as part of the control efforts during cholera outbreaks, is becoming increasingly common. To our knowledge, this is the first documented experience that has demonstrated that during a large-scale cholera outbreak, the distribution of simple kits, with readily available cleaning products and materials, combined with health promotion is easy, feasible and valued by the target population. More than 60% of patients and their caregivers claimed the HDKs with their vouchers during the two-month period of the pilot project, and the follow up survey results suggested that recipients readily used the items contained in the kit, particularly chlorine and soap.

The survey, following the implementation of the HDK programme, also illustrated several aspects of the intervention that could be modified and improved during future cholera response operations. The objective of any HDK distribution should be to reach 100% of all new suspected cholera patients, and at the time of their admission, so that hygiene practices in affected households are immediately reinforced and disinfection takes place as soon as possible. This can be done through a more targeted information session to caregivers and family members of cholera patients at the time of admission to the CTC, by stressing the importance of using the kits as quickly as possible within the household. In Haiti, some cholera patients did not have a caregiver present at the time of their admission, so we would need to identify other ways of ensuring that HDKs were distributed to these households immediately. One possibility could be by using outreach workers to visit the affected households on the day of admission of the respective patients, or by establishing decentralised distribution points for the HDKs in neighbourhoods, such as at Oral Rehydration Points or Cholera Treatment Units. Our results also showed that self-reported use of the HDK items was high, and that following improved and strengthened health promotion activities on 24 January 2011, self-reported use of all the items in HDKs increased. It is possible that these results are over-estimated, as self-reported use of products that have been received for free is potentially biased. However, we do think it is likely that the adapted health promotion messages, stressing the importance of

using all the kit's content and cleaning/disinfecting everything in the household, impacted on the overall use of the kits in cholera-affected households. In future, adapted messages could also improve the sharing of the kit's contents with family members and neighbours, especially if greater quantities of items such as chlorine and soap are included.

In our experience with HDK distribution, we conducted health promotion sessions to groups of patients and caregivers as the sessions were time consuming and persons gained more from questions and answers in this format. We recognise that this puts a burden on time and human resources during outbreak response activities, but think that it is a rare occasion in which to address household members of cholera patients directly with focused health and hygiene messages for cholera prevention, and should therefore always be enforced and included when conducting HDK distributions.

The survey was not planned as an intervention 'study' and as such did not include a control group or other form of comparison group. We therefore recognise that there are several limitations inherent to our results and would like to list those of particular importance which merit further planned study in future cholera interventions. This survey was only able to assess the impact on the knowledge of HDK recipients on what to do with the contents of the kit, using sequential sampling of 200 households (17% of all HDK recipients). It is therefore possible that the survey did not assess a representative sample of the kit recipient population. However, as the majority of kit recipients were from the same part of Port-au-Prince, we assume that the sample of households we did interview were reflective of those in Carrefour. We did not measure the impact of the time of ownership of the HDKs at the time of the survey on their self-reported use. It is possible that persons who had only recently received the kit were more likely to report higher usage of products than those who had had the kits for a longer period. Our survey did not assess the epidemiological impact on the transmission of cholera within households that used the kits. We would expect that households that used kits appropriately and frequently would have a lower level of household transmission of cholera, which would be very strong evidence for recommending their use in future outbreaks. The survey did not include an observational component (i.e. observing the presence and use of HDK items) or a longer-term follow-up

survey, both of which would be indicators of actual behaviour change for disinfection practices in cholera-affected households. Future evaluations of HDK impact at household level need to explore this aspect also, as the sustainability of such an intervention will depend on adopted new behaviours by the population.

CONCLUSION

The cholera outbreak in Haiti between 2010 and 2011 was unprecedented in magnitude and impact on the previously cholera-naïve population (Dowell & Braden 2011). In this context, all possible measures needed to be implemented that reduced transmission as quickly as possible. This evaluation has shown that qualitatively the HDK distribution has a great potential in reducing household level transmission of cholera. We would like to encourage actors during cholera outbreak response to continue using HDKs as part of their implemented measures, to document their distribution and use in operational settings and if possible to measure the epidemiological impact of their use. Only by collecting this information can we build a strong enough evidence base to promote the use of such kits in the future as an integral part of cholera outbreak response.

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REFERENCES

- DINEPA (Direction Nationale de l'Eau Potable et de l'Assainissement) 2010 Stratégie Nationale de Réponses à l'Epidémie de Choléra. Available from: <http://www.pseau.org/outils/biblio/resume.php?d=2128>.
- Dowell, S. F. & Braden, C. R. 2011 Implications of the introduction of cholera to Haiti. *Emerg. Inf. Dis.* **17**, 1299–1300. Available from: <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3381415&tool=pmcentrez&rendertype=abstract>.
- Haiti MoF (Haiti Ministry of Finance) 2003 Haiti, 2003 – Population and Housing Census (PHC). The Haitian Institute of Statistics and Information. <http://surveynetwork.org/home/index.php?q=activities/catalog/surveys/ihsn/332-2003-001> (accessed 23 March 2013).
- Kone-Coulibaly, A., Tshimanga, M., Shambira, G., Gombe, N. T., Chadambuka, A., Chonzi, P. & Mungofa, S. 2010 Risk factors associated with cholera in Harare City, Zimbabwe, 2008. *East Afr. J. Public Health* **7** (4), 311–317.
- Lamond, E. & Kinyanjui, J. 2012 Cholera Outbreak Guidelines. Oxfam. Available from: <http://policy-practice.oxfam.org.uk/publications/cholera-outbreak-guidelines-preparedness-prevention-and-control-237172>.
- Mahamud, A. S., Ahmed, J. A., Nyoka, R., Auko, E., Kahi, V., Ndirangu, J., Nquhi, M., Burton, J. W., Buhindo, B. Z., Breiman, R. F. & Eidex, R. B. 2012 Epidemic cholera in Kakuma Refugee Camp, Kenya, 2009: the importance of sanitation and soap. *J. Inf. Dev. Ctries* **6**, 234–241. Available from: <http://www.jidc.org/index.php/journal/article/view/22421604>.
- Médecins Sans Frontières (MSF) 2004 Cholera Guidelines. © Médecins Sans Frontières.
- O'Connor, K. A., Cartwright, E., Loharikar, A., Routh, J., Gaines, J., Fouché, M. D.-B., Jean-Louis, R., Ayers, T., Johnson, D., Tappero, J. W., Roels, T. H., Roodly Archer, W., Dahourou, G. A., Mintz, E., Quick, R. & Mahon, B. E. 2011 Risk factors early in the 2010 cholera epidemic, Haiti. *Emerg. Infect. Dis.* **17** (11), 2136–2138.
- Siddiqui, F. J., Bhutto, N. S., Von Seidlein, L., Khurram, I., Rasool, S., Ali, M., Zafar, A., Deen, J. L., Clemens, J. D., Nizami, Q. & Bhutta, Z. A. 2006 Consecutive outbreaks of *Vibrio cholerae* O139 and *V. cholerae* O1 cholera in a fishing village near Karachi, Pakistan. *Trans. Royal Soc. Trop. Med. Hyg.* **100**, 476–482.
- WHO (World Health Organization) 1993 *Guidelines for Cholera Control*. WHO, Geneva. Available from: <http://whqlibdoc.who.int/publications/1993/924154449X.pdf>.

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