Filling evidence gaps for commonly used cholera interventions

Cholera outbreaks are an increasing concern, particularly in communities without water and sanitation. Many interventions are used to reduce transmission in communities and households, but there is little evidence to inform their use.

As part of a larger programme of work on infectious disease control, Tufts University conducted the study, 'Establishing evidence for common-but-under-researched WASH cholera interventions', between 2017 and 2020 in the Democratic Republic of the Congo, Bangladesh and Haiti.

The study made valuable contributions to the evidence base around cholera interventions, and increased awareness and knowledge among humanitarian professionals, policymakers, researchers and academics. It helped to inform national and global policy and programming through national cholera control plans and highlighted the interconnectedness of infectious diseases, for example cholera, Marburg virus, Ebola and COVID-19, and the need for similar interventions. The research skills of all study partners were also strengthened for them to deliver high-impact research in the future.

Title: Establishing Evidence for Common-but-Under-Researched WASH Cholera Interventions

Location: Bangladesh, Democratic Republic of Congo and Haiti

Study type: Mixed methods (key informant interviews, surveys, focus groups, intervention testing, environmental testing)

IMPACTS

- Findings informed adaptations of the national response to cholera by the WASH cluster in Nigeria and study partner NGOs
- The US Office of Foreign Disaster Assistance and USAID's Bureau for Humanitarian Assistance (BHA) used the study findings to inform their guidance to BHA-funded cholera response programmes.
- Study team members directly contributed learning to National Cholera Control plans via membership of Global Task Force on Cholera Control

RESEARCH IMPACT LEARNING

- Sharing results quickly, in practitioner-friendly formats, and articulating simple, clear messages
- Engaging consistently with humanitarian networks and building personal relationships

BACKGROUND

Cholera is a virulent diarrheal disease that can cause death. It is most common in areas without water and sanitation infrastructure, especially in humanitarian emergencies. In the last few years there has been an explosion in cholera outbreaks, with now over 2 billion people at risk of cholera.

Many community- and household-level water, sanitation and hygiene (WASH) interventions are employed worldwide to reduce cholera transmission, such as water treatment (eg, bucket chlorination), the provision of toilets, and the promotion of handwashing and environmental hygiene. However, most of these interventions are under-researched, and there is little evidence to confirm their efficacy and effectiveness.

In 2015 the World Health Organization (WHO)'s Global Task Force on Cholera Control (GTFCC) called for more evidence on cholera response interventions to inform WASH policy and practice in humanitarian settings.

Tufts University had recently completed three studies: two investigating the effectiveness of household and source water treatment options in emergencies, and one testing the efficacy of chlorine-based surface cleaning recommendations to prevent Ebola transmission. Relationships built during these prior studies were leveraged for this study.

THE STUDY

The study aimed to address the evidence gaps, focusing on three cholera response interventions commonly implemented in crisis settings: 1) household spraying, 2) household disinfection kits and 3) bucket chlorination. The team undertook laboratory work to establish the efficacy of these interventions, and field trials to establish their real-world effectiveness. The team could not find any partners implementing household disinfection kit interventions, so the planned field evaluation was pivoted to key informant interviews with responders and a field trial in Haiti to understand the training needed for lay individuals to use household disinfection kits.

Field effectiveness trials were conducted using a mixed-methods methodology, including key informant interviews with programme staff, household surveys and focus groups with recipients of the interventions, plus testing of interventions and environmental testing of water and surfaces for the Vibrio (V.) cholerae bacteria. Laboratory efficacy data was collected in a US laboratory. A systematic review of chlorine-based surface disinfection results from low-resource outbreak settings, and a study on whether Escherichia (E.) coli could be used as a surrogate for V. cholerae in the laboratory were also completed. Some research outputs were co-funded by the Office of U.S. Foreign Disaster Assistance (OFDA). Field locations were in Cox's Bazar (Bangladesh), the Democratic Republic of the Congo and Haiti.

FINDINGS

The study found that household spraying and bucket chlorination displayed varying effectiveness across field locations studied, depending on how they were implemented in each context. Regarding household disinfection kits, the study indicated disparity between international and local responders, and gaps between global policy and field practice. International-level responders know and prefer household disinfection kits, while local responders do not know kits and prefer household spraying. The trial in Haiti showed that longer training where participants interacted with the kits was more effective than a lecture.

The laboratory research found that the optimum concentration for household disinfection was 0.2% chlorine when sprayed or wiped on most non-heavily soiled surfaces and 2.0% chlorine when used on contaminated, porous surfaces (such as bedding or latrines). The laboratory research also found that surfaces must be visibly wetted to achieve disinfection (whether by spraying or wiping), and that bucket chlorination was efficacious at inactivating V. cholerae and providing residual chlorine when the dosage was determined correctly, using both fixed dosage and jar testing methods.

A rural bucket chlorination point and three chlorination agents, Mbuji-Mayi, DRC. Credit: Gabrielle String/ Solidarités International

COMMUNICATIONS AND ENGAGEMENT

Collaboration between the team at Tufts University and leading humanitarian agencies such as the International Federation of Red Cross and Red Crescent Societies (IFRC), Médecins Sans Frontières, AIDES, Action Against Hunger and Clean Water for Haiti was essential to the success of the study, contributing vital local knowledge and technical and local logistical capacity. For example, Médecins Sans Frontières provided valuable input into the study design. Relationships with field partners were also crucial to enable data collection in operational projects.

The study findings were published in various reputable peer-reviewed journals, such as Water Research and Journal of Water and Health. They were also disseminated at global forums attended by leading practitioners and policymakers, such as the University of North Carolina Water and Health Conference and the Emergency Environmental Health Forum. Presentations were well received, increasing knowledge, understanding and action on cholera-related interventions. Reports and briefings were also produced for field partners and disseminated in English and local languages within a month of study completion – enabling rapid uptake of findings. The key messages were packaged for different audiences to increase uptake, including translating scientific findings into clear, succinct key messages (such as 'Spray the surface until it is wet') to increase the memorability for practitioners and community members.

Longstanding partnerships with other key global organisations including WHO, the United States Agency for International Development (USAID) and UNICEF, were also important for optimising the reach of the study findings, as was the involvement of local authorities in the health sector.

Finally, Professor Daniele Lantagne, the study's Principal Investigator from Tufts University, sits on various strategic, global committees actively involved in shaping cholera and WASH policy and practice, and regularly engages with the Global WASH Cluster. These relationships allowed a dialogue between the study team and key international stakeholders for ongoing advice and feedback on cholera interventions.

UPTAKE AND IMPACT

The study made valuable contributions to the evidence base for the three interventions studied, and the findings continue to directly inform the ongoing policy debate on household disinfection to control cholera.

"The study's lab work on the efficacy of using chlorine on different surfaces combined with the field evaluations are highly relevant and contribute to filling a critical knowledge gap for cholera control."
– Kathryn Alberti, Technical Officer Cholera, WHO GTFCC

Awareness around how to prevent and manage cholera transmission increased, particularly among WASH humanitarian professionals, policymakers, researchers and academics, contributing to improved practices and reduced morbidity and mortality in both crisis-affected and stable populations. The study team's participation in key platforms such as the WHO committees on the prevention of infectious disease and the GTFCC accelerated this increased awareness on a global scale.

The study led to adaptations of the national response to cholera by the WASH cluster in Nigeria. Via engagement with the Global Task Force, National Cholera Control Plans have been influenced, and the guidance on developing such plans has also been updated accordingly. GTFCC's platforms have been updated in line with the study findings. Action Against Hunger incorporated the study results into its cholera toolkit published in 2023.

OFDA and USAID's Bureau for Humanitarian Assistance (BHA) also used the study findings to inform their guidance to BHA-funded cholera response programmes.

"We place an emphasis on evidence-based interventions and appreciate having more rigorous data and evaluations. The fieldwork in humanitarian settings is particularly important as so much research for WASH is based in more stable contexts and we have to extrapolate to our settings in the absence of research such as this."
– Tracy Wise, USAID, Office of Technical and Program Quality and BHA

Study team members directly contributed to policy and guidance on prevention and management of other infectious diseases at the highest global level. For example, Professor Daniele Lantagne, was invited to sit on both the WHO's COVID-19 Infection Prevention and Control Guidance Development Group and the Ebola Guideline Development Group for Infection Prevention and Control.

The study findings also provided insights on the interconnectedness of infectious diseases, for example cholera, Marburg virus, Ebola and COVID-19, and the need for similar interventions. Findings have therefore been incorporated into a larger body of work by Tufts University on surface disinfection, which could lead to greater impacts on diseases of concern to humanitarian health actors such as Ebola and COVID-19.

This study increased the visibility, credibility and capacity of the study team to deliver research that can improve WASH policy and practice, as well as improving the research skills of all study partners for them to deliver high-impact research in the future.

"[The study] was timely and useful to our work." – Monica Ramos, UNICEF, Global WASH Cluster Coordinator

RESEARCH IMPACT LEARNING

SHARING RESULTS QUICKLY AND ARTICULATING SIMPLE, CLEAR MESSAGES

An emphasis on immediate translation of results (briefings and tailored reports) for field-based organisations has enabled rapid understanding and incorporation of study findings into practice at partner organisations.

ENGAGING CONSISTENTLY WITH HUMANITARIAN NETWORKS

The experience of the study team demonstrates the importance of building reciprocal, mutual learning relationships with key humanitarian networks, such as WASH clusters, to sensitise partners to forthcoming results and build trust in the eventual findings, which are tailored to operational needs and priorities.

PARTNERS

Tufts University; International Federation of Red Cross and Red Crescent Societies ; Médecins Sans Frontières; Solidarités International; AIDES

ABOUT ELRHA

Elrha is a global organisation that finds solutions to complex humanitarian problems through research and innovation. This study was funded by Elrha's Research for Health in Humanitarian Crises (R2HC) Programme which aims to improve health outcomes by strengthening the evidence base for public health interventions in humanitarian crises.

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R2HC captures detailed case studies through a process that triangulates and validates evidence on uptake and impact. The case study methodology and full version of this summary case study including references are available on request.

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