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Mass vaccination with a two-dose oral cholera vaccine in a long-standing refugee camp, Thailand

Christina R. Phares[a,b,*], Kashmira Date[c], Philippe Travers[d], Carole Déglise[e], Nuttapong Wongjindanon[b], Luis Ortega[a,b], Ponchanok Rattanadilok Na Bhuket[f]

[a] Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop E03, Atlanta, GA 30329, USA
[b] Thailand Ministry of Public Health, U.S. Centers for Disease Control and Prevention Collaboration, Ministry of Public Health, Tivanond Road, Nonthaburi 11000, Thailand
[c] Global Immunization Division, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop A04, Atlanta, GA 30329, USA
[d] Première Urgence—Aide Médicale Internationale, 21/22–26 Mae Sot-Mae Tao road Tak 63110, Thailand
[e] Première Urgence—Aide Médicale Internationale, Paris, France
[f] Department of Disease Control, Thailand Ministry of Public Health, Tivanond Road, Nonthaburi 11000, Thailand

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ABSTRACT

Background: During 2005–2012, surveillance in Maela refugee camp, Thailand, identified four cholera outbreaks, with rates up to 10.7 cases per 1000 refugees. In 2013, the Thailand Ministry of Public Health sponsored a two-dose oral cholera vaccine (OCV) campaign for the approximately 46,000 refugees living in Maela.
Methods: We enumerated the target population (refugees living in Maela who are ≥1 year old and not pregnant) in a census three months before the campaign and issued barcoded OCV cards to each individual. We conducted the campaign using a fixed-post strategy during two eight-day rounds plus one two-day round for persons who had missed their second dose and recorded vaccine status for each individual. To identify factors associated with no vaccination (versus at least one dose) and those associated with adverse events following immunization (AEFI), we used separate marginal log-binomial regression models with robust variance estimates to account for household clustering.
Results: A total of 63,057 OCV doses were administered to a target population of 43,485 refugees. An estimated 35,399 (81%) refugees received at least one dose and 27,658 (64%) received two doses. A total of 993 additional doses (1.5%) were wasted including 297 that were spat out. Only 0.05% of refugees, mostly children, could not be vaccinated due to repeated spitting. Characteristics associated with no vaccination (versus at least one dose) included age ≥15 years (versus 1–14 years), Karen ethnicity (versus any other ethnicity) and, only among adults 15–64 years old, male sex. Passive surveillance identified 84 refugees who experienced 108 AEFI including three serious but coincidental events. The most frequent AEFI were nausea (49%), dizziness (38%), and fever (30%). Overall, AEFI were more prevalent among young children and older adults.
Conclusions: Our results suggest that mass vaccination in refugee camps with a two-dose OCV is readily achievable and AEFI are few.

1. Introduction

Exclusive use of clean drinking water and good sanitation and hygiene are the most effective means of preventing epidemic cholera and many other diseases, yet these basic measures are still deficient in many places. Some public health authorities have proposed the use of oral cholera vaccine (OCV) as a complementary measure in areas at risk for cholera [1,2]. A whole-cell killed OCV with recombinant cholera toxin B subunit, Dukoral® (Crucell/SBL Vaccine, Sweden), has been available for more than two decades but at a prohibitive price for mass vaccination in resource-constrained

Abbreviations: PU—AMI, Première Urgence—Aide Médicale Internationale; MOPH, Ministry of Public Health; CDC, U.S. Centers for Disease Control and Prevention.

* Corresponding author at: Division of Global Migration and Quarantine, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop E03, Atlanta, GA 30329, USA. Tel.: +1 404 639 4350; fax: +1 404 639 4441.
E-mail addresses: cphares@cdc.gov (C.R. Phares), kdate@cdc.gov (K. Date), travers_philippe@yahoo.fr (P. Travers), cdeglise@pu-ami.org (C. Déglise), nwongjindanon@cdc.gov (N. Wongjindanon), ortegal@cdc.gov (L. Ortega), tapanokr@yahoo.com (P.R.N. Bhuket).

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settings. A less expensive, more easily administered, and similarly constituted OCV (minus the B subunit), Shanchol™ (Shantha Biotechnics, India), was licensed for the first time in India in 2009 and prequalified by the World Health Organization (WHO) in 2011, bringing at the time more attention and debate to the public health role of cholera vaccination [3].

Refugee camps, often overcrowded, are vulnerable to epidemic cholera when environmental conditions are unsanitary [4–6]. These conditions are more commonly seen in crisis situations but can also occur in established camps. Maela refugee camp, created in 1984 in northern Thailand, is one such long-standing yet vulnerable camp. Maela provides shelter for approximately 46,000 predominately Karen refugees from Burma and has experienced recurring cholera outbreaks since at least 2005 (data for prior years are not available). Maela is administered by the Royal Thai Government's Ministry of Interior, while international non-governmental organizations (NGOs) provide essential services. The NGO Première Urgence—Aide Médicale Internationale (PU—AMI) has provided health services since 2005. In 2013, the Thailand Ministry of Public Health (MOPH) sponsored a two-dose Shanchol™ OCV campaign, partnering with PU—AMI and the U.S. Centers for Disease Control and Prevention (CDC) for implementation and evaluation. We review the history of cholera in Maela and describe the campaign including estimated coverage, factors associated with vaccine uptake, vaccine wastage, adverse events following immunization (AEFI), and factors associated with AEFI.

2. Methods

2.1. Cholera surveillance review

We reviewed PU—AMI cholera surveillance data from 2005 through 2012. From 2008 through 2012, all patients seeking care for acute watery diarrhea with moderate or severe dehydration during a confirmed outbreak received confirmatory testing (isolation of toxigenic *Vibrio cholerae* O1); before 2008, during a confirmed outbreak, some patients were presumptively diagnosed. Confirmatory testing was performed by a government hospital using Cary-Blair media for transport and thiosulfate citrate bile salts sucrose agar for isolation. Suspected *V. cholerae* colonies were tested by slide agglutination with specific monoclonal antibodies to identify the serogroup (O1 or O139) and serotype (Ogawa or Inaba).

2.2. Pre-campaign information, education, and communication activities

In the months leading up to the campaign, PU—AMI began providing information about cholera, prevention, and vaccination in meetings with camp-based governance committees, religious and civic leaders, and school principals and teachers. These leaders in turn informed their constituencies through town hall meetings, the camp newsletter, and informal communications. Social mobilization also included personal communications by PU—AMI community health workers during routine home visits. Other communications included classroom presentations, posters, and reminders via loudspeaker on the days leading up to the campaign.

2.3. Census and vaccine cards

PU—AMI conducted a pre-campaign census in October–November 2012, three months before the start of the vaccine campaign. Census workers, themselves refugees living in Maela, administered a standard questionnaire to one adult (≥18 years) member of each household and cross-checked demographic data with household food ration books. The census questionnaire collected individual-level data on name, sex, age, ethnicity, and length of residency in Maela and household-level information on environmental and behavioral characteristics related to water, sanitation, and hygiene. Upon completion, PU—AMI distributed barcoded OCV cards to each person identified in the census.

2.4. Campaign strategy

PU—AMI conducted the campaign in two rounds open to all eligible refugees plus a third, shorter round for refugees who had already received their first, but not their second, dose. The rounds took place two weeks apart in January, February, and March 2013, before the start of the rainy season. PU—AMI used a fixed-post strategy plus mobile teams (who offered vaccine to house-bound refugees, hospital inpatients, and children at some schools). The first two rounds lasted eight days each. The third round lasted two days.

Each post was staffed by 20–25 workers. Entry screeners obtained consent (verbally as illiteracy is high), screened for the excluded conditions of pregnancy (by self-report) or age <1 year, and scanned OCV cards or issued temporary cards. Vaccinators opened each vaccination vial, ensured the entire dose was consumed, and offered a second dose (but not a third dose) in the case of spitting or vomiting. Exit controllers marked the back of the hand of the vaccinated with indelible markers in order to avoid inadvertent revaccination during a single round. After ingesting the vaccine, water was offered for the vaccinees' comfort and to reduce spitting. In response to frequent complaints about taste, PU—AMI flavored the water with syrup to help wash away the taste.

2.5. Vaccine registry

For refugees who sought vaccination and brought their barcoded OCV cards to the campaign, staff scanned the card to record date, time, and vaccine status for each refugee. For refugees who came without their OCV cards and refugees who were vaccinated offsite by mobile teams, staff issued temporary cards to capture this information. After the campaign, PU—AMI attempted to find each temporary cardholder in the census database, matching by name, date of birth or age, sex, address, and ration book number. Temporary cards that could not be matched were accounted for during statistical analysis as described below.

2.6. Adverse events following immunization

To detect AEFI on campaign days, staff encouraged refugees to wait in a designated area for 30 min immediately after ingesting the vaccine. Staff observed refugees and notified medics when AEFI occurred. Medics at camp clinics monitored inpatient and outpatient admissions for AEFI from the first day of each round through 14 days after the last day for a given round. All serious adverse events were investigated to assess a causal relationship with vaccination.

2.7. Statistical analysis

Because we determined first versus second dose according to the date of vaccination as recorded on OCV cards and temporary cards, the failure to identify some temporary cardholders in the census database introduced uncertainty into our estimate of vaccine coverage. For example, if a refugee was vaccinated during round two, received a temporary card, and could not be matched to a person in the census database, then we do not know whether that round two dose was a first dose (refugee did not attend round one) or a second dose (refugee brought an OCV card to round one but not round two). To account for this uncertainty, we calculated the minimum and maximum vaccine coverage statistics according to two different assumptions: