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Oral cholera vaccine coverage in hard-to-reach fishermen communities after two mass Campaigns, Malawi, 2016

Delphine Sauvageot^{a,*}, Christel Saussier^a, Abebe Gobeze^b, Sikhona Chipeta^c, Innocent Mhango^d, Gift Kawalazira^e, Martin A. Mengel^a, Dominique Legros^f, Philippe Cavailler^a, Maurice M'bang'ombe^c

^a Agence de Médecine Préventive, Paris, France

^b UNICEF, Malawi Country Office, Lilongwe, Malawi

^c Ministry of Health, Community Health Sciences Unit, Lilongwe, Malawi

^d Ministry of Health, District Health Office, Machinga, Malawi

^e Ministry of Health, District Health Office, Zomba, Malawi

^f World Health Organization, Geneva, Switzerland

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ABSTRACT

Context: From December 2015 to August 2016, a large epidemic of cholera affected the fishermen of Lake Chilwa in Malawi. A first reactive Oral Cholera Vaccines (OCV) campaign was organized, in February, in a 2 km radius of the lake followed by a preemptive one, conducted in November, in a 25 km radius. We present the vaccine coverage reached in hard-to-reach population using simplified delivery strategies.

Method: We conducted two-stage random-sampling cross-sectional surveys among individuals living in a 2 km and 25 km radius of Lake Chilwa (islands and floating homes included). Individuals aged 12 months and older from Machinga and Zomba districts were sampled: 43 clusters of 14 households were surveyed. Simplified strategies were used for those living in islands and floating homes: self-delivery and community-supervised delivery of the second dose. Vaccine coverage (VC) for at-least-two-doses was estimated taking into account sampling weights and design effects.

Results: A total of 1176 households were surveyed (2.7% of non-response). Among the 2833 individuals living in the 2 km radius of Lake and the 2915 in the 25 km radius: 457 (16.1%) and 239 (8.2%) lived in floating homes or on islands at some point in the year, respectively. For the overall population, VC was 75.6% and 54.2%, respectively. In the 2 km radius, VC was 92.2% for those living on the lake at some point of the year: 271 (64.8%) used the simplified strategies. The main reasons for non-vaccination were absence during the campaign and vaccine shortage. Few adverse events occurring in the 24 h following vaccination was reported.

Conclusions: We reached a high two-dose coverage of the most at-risk population using simplified delivery strategies. Because of the high fishermen mobility, regular catch-up campaigns or another strategy specifically targeting fishermen need to be assessed for more efficient vaccines use.

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Abbreviations: AEFI, Adverse Event Following Immunization; AMP, Agence de Médecine Préventive; DOV, Directly Observed Vaccination; HH, Household; MoH, Ministry of Health; MSF, Médecins Sans Frontières; OCV, Oral Cholera Vaccine; VC, Vaccine Coverage; WASH, Water Sanitation Hygiene.

* Corresponding author at: Agence de Médecine Préventive, 21 boulevard Pasteur, 75015 Paris, France.

E-mail addresses: dsauvageot@aamp.org (D. Sauvageot), csaussier@aamp.org (C. Saussier), agobeze@gmail.com (A. Gobeze), smchipeta@gmail.com (S. Chipeta), innocentmhango@gmail.com (I. Mhango), gkawalazira@yahoo.co.uk (G. Kawalazira), mmengel@aamp.org (M.A. Mengel), legrosd@who.int (D. Legros), pcavailler@aamp.org (P. Cavailler), mbangombe@yahoo.com (M. M'bang'ombe).

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1. Introduction

Despite improvements in access to safe water provision and proper sanitation, cholera remains a significant public health concern in Malawi. The Lake Chilwa located in the Southern of Malawi has a turbidity and a mineral content ideal for *Vibrio cholerae*. The population living in the three districts surrounding the lake (Machinga, Zomba and Phalombe), mainly fishermen and their families, were identified as having a high-risk for cholera [1]. Some fishermen, from 3000 in low fishing season to approximately 10,000 in high season, leave their home village for living in the islands or in the *Zimboweras* (temporary floating homes) by groups

of 10–16 individuals. They stay for from one up to three months without coming ashore and use the lake for drinking, defecating, bathing, and cooking. As it takes around three hours by canoe to reach the land, they have a poor access to health care [2,3].

Cholera cases were reported annually in this area with large outbreaks occurring in 2002, 2010, 2012, and 2016. Between January and September 2016, a total of 1256 suspect cholera cases were notified mainly affecting fishermen [2,3]. In response to this epidemic, a two-dose mass campaign with oral cholera vaccine (OCV) using Shanchol (Shanta-Biotechnics, Hyderabad, India) was conducted in February–March 2016 by the Ministry of Health (MoH), with the support of *Médecins Sans Frontières* (MSF)-France, and *Agence de Médecine Préventive* (AMP). A total of 190,000 vaccine doses were delivered to individuals living within a 2 km radius of the lake, on the shore, the islands and *Zimboweras* located in the three districts surrounding the lake. In March–April 2016, the two-dose vaccine coverage was 91% in islands, 79% in *Zimboweras* and 53% on the shore [4].

However, additional fishermen moved to the lake for fishing and cholera cases continued to be notified until September 2016 in the Machinga and Zomba districts. Because of frequent population movement from the villages in land to the lake and a cholera outbreak difficult to control, the MoH decided to conduct a second OCV campaign at the end of the fishing season in order to vaccinate the remaining seasonal fishermen and other at-risk individuals in their home village. In November 2016, 180,000 doses of Euvichol vaccines (EuBiologics, Seoul, South Korea) were delivered, targeting all individuals aged 12 months and older, not fully vaccinated, living within 25 km radius of the lake in Machinga and Zomba districts.

This paper summarizes the results of the cholera immunization coverage survey conducted in December 2016 by the MoH with the support of UNICEF and AMP, in populations living in a 2 km radius of the lake (the most at-risk population because of their proximity with the lake) and in the 25 km radius of the lake (considered as part of the cholera hotspot by the MoH). The primary objective of the survey was to assess the vaccine coverage reached after the two successive OCV campaigns, in the both targeted areas. The secondary objectives were to describe the vaccine coverage per age groups and in specific at-risk individuals such as people living in islands or *Zimboweras* at some point of the year. The reasons of non or partial vaccination, the mode of vaccine dose delivery, the vaccine side effects following Euvichol oral vaccine administration were detailed.

2. Methods

2.1. Presentation of the OCV campaigns

The first OCV campaign took place between February 16 and 22, 2016 (1st round) and the second round between March 9 and 15, 2016 (2nd round). The targeted population was living in a 2 km radius of the lake, including the islands and fishermen settled in *Zimboweras*, in the districts of Machinga, Zomba, and Phalombe. All individuals received their first dose via the standard method, Directly Observed Vaccination (DOV) at immunization points. For the second dose, two innovative simplified delivery strategies were used. During the first round, those living in *Zimboweras* were given an extra dose on the same day of the first dose intake and were instructed to drink it at home 14 days after the first dose (self-delivery strategy). On the islands, at the end of the first round, a stock of vaccines was entrusted to the community leaders who distributed them, fourteen days after the first round, to the households heads for home-based self-administration (community supervised delivery strategy).

The second OCV campaign was conducted nine months after the first one. The target population was living in a 25 km radius, including the islands and the *Zimboweras* in Machinga and Zomba districts, two out of the three districts surrounding the lake. The first round was carried out between November 14 and 20, 2016 and the second between December 5 and 9, 2016. The first and the second dose were delivered by DOV at 110 immunization points. In both *Zimboweras* and islands, only the self-delivery strategy for the second dose was used.

The immunization cards were systematically distributed during each campaign. At immunization point, the vaccinators recorded on the cards the date of the dose administration and the scheduled date for the next one. If one individual was two-dose vaccinated in February–March, he was not vaccinated in November–December. If the self-delivery strategy was used, only the scheduled date for the 2nd dose administration was recorded. If the community-supervised delivery strategy was used, the community leader recorded the date of second dose delivery on the card.

2.2. Cross-Sectional surveys

All individuals' aged 12 months and older (target age group for OCV), residents of Machinga and Zomba districts, within a 2 km radius of lake (target population for the first campaign) or a 25 km radius (target population for the second campaign), were eligible for inclusion in the coverage surveys. All the islands located in Machinga and Zomba districts (Chisi, Chidyamphiri, Thongwe, and Chinguma) were included in the targeted areas. Two representative samples of the population were selected using a cluster-based two-stage random sampling: one in the 2 km radius of the lake and one in the 25 km radius of the lake. Given that the two target areas geographically overlap, populations living on the islands, the *Zimboweras*, and in the 2 km radius can be sampled for both surveys.

The sample size was calculated to obtain an estimate of the proportion of individuals who received two doses of OCV by age group (1–4, 5–14, 15 years and older) in each targeted area. Sample sizes were calculated to ensure a sufficiently precise estimate for children aged 1–4 years as this group was the smallest. We considered the following assumptions: 70% two doses vaccine coverage, a design effect (DE) of 3.0 (potential heterogeneity of clusters for immunization), 8% precision and 95% confidence interval (CI). According to the 2010 Demographic and Health Survey, the mean household (HH) size was four individuals with 18% of children 1–4 years old. Assuming 12% of absence or refusals, we, therefore, planned to survey 602 households (43 clusters of 14 HH) in each targeted area. A cluster was a group of households selected by proximity in one given village. A household was defined as a group of people sleeping under the same roof and sharing meals every day for at least the previous two weeks. Villages were randomly selected proportionate to their population size using the December 2016 census performed by the health community workers (221,051 inhabitants estimated within 25 km radius of the lake). The sampling frame was elaborated for the survey purpose. Once the villages were identified, a direction was selected from the geographical center of the village using the “spinning a pen on the ground” method. All the houses in this direction were counted then one (the first household of the cluster) was randomly selected using a random number table. The subsequent homes to be visited will be the second nearest one at right hand until the 14 households were enrolled. In each household, all individuals older than one year old were included.

A standardized, pre-piloted questionnaire was used. We collected data on age, sex, duration in months spent in islands or *Zimboweras* in the past fishing season, the mode of vaccine administration (DOV, self administration, community supervised

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