



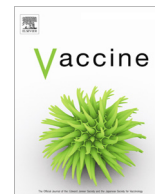
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Challenges, best practices, and lessons learned from oral cholera mass vaccination campaign in urban Cameroon during the COVID-19 era



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ABSTRACT

Background: Since 1971, Cameroon has been facing an ever-growing series of cholera epidemics; despite all the efforts made by the government to address this substantial public health problem. In 2020, in addition to the COVID-19 pandemic, Cameroon recorded a high cholera case fatality rate of 5.3% following epidemics noted in the South, Littoral, and South-West regions which is far higher than the 1% World Health Organization acceptable rate.

Methodology/principal findings: The Ministry of Public Health organized a reactive vaccination campaign against cholera to address the high mortality rate in the affected health districts. The first round was in August 2020 and the second in March 2021. We conducted a cross-sectional study and reviewed this vaccination campaign's challenges, best practices, and lessons. The vaccination coverage for the two doses of the oral cholera vaccine was 80.4%, with a refusal rate as high as 67%. People 20 years and above recorded the lowest vaccination coverage. The main challenge was misinformation about the cholera vaccine. The best practice was thorough population sensitization through community actors.

Conclusion: Proper communication will always brave the odds of hesitancy and favor mass population vaccination to thwart hesitancy and consolidate herd immunity.

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1. Background

Vaccination programs in Africa have made extraordinary progress since the Expanded Program on Immunization in 1974 [1]. The World Health Organization (WHO) estimates that there are 1.3–4.0 million cholera cases annually and that 21,000 to 143,000 of them result in death [2]. Since the Oral Cholera Vaccine

(OCV), there has been a reduction in cholera cases in many endemic regions. In Cameroon, coastal areas like the Littoral, Southwest, and South Regions commonly experience outbreaks.

The Littoral Region of Cameroon and particularly the town of Douala is one of the commonly affected regions by cholera in the country. In Douala, like in many areas where cholera is endemic, the high morbidity and consequent mortality caused by cholera are attributable to several factors, including lack of access to safe drinking water, poor sanitation, and poor hygiene practices (WASH). Controlling cholera in the region remains a significant challenge as many people still live in unclean places and access to drinking water remains low. In 2020, the region registered 979 suspected cases with 49 deaths. Out of these cases, only 538 were analyzed, and 185 were positive. By 2021, 10 suspected cases were detected, with one death. The southwest region is also a common site for the cholera outbreak. This region has two districts

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(Limbe and Tiko) that lie along the coast of Douala. Mabeta Health Area (HA) is one of the 08 HA in Limbe health district. Its shares common boundaries with the Tiko health district and the Littoral region. Mabeta alone recorded a series of highly suspected but not confirmed Cholera cases in June 2020. Because of its proximity and influx of traders from the neighboring infected communities like Tiko and Douala, it was paramount for the Ministry of Public Health to include Mabeta in the reactive Cholera campaigns of August 2020 and March 2021.

On May 13, 2020, the first case of cholera in the South Region was confirmed by Rapid Diagnosis Test (RDT) in the Londji Health Area (Kribi District). On the 22nd of the same month, the Health Districts of Meyomessala and Sangmelima recorded three confirmed cases. The Kribi Health Area has poor sanitary conditions exhibited by households lacking basic latrine facilities. The presence of the Atlantic Ocean makes this community highly visited by tourists, as such it experiences a regular influx of people. This region is neighboring the highly commercial city of Douala in the Littoral Region. In this region, cholera vaccination was done in five HA, including Adjap, Grand Batanga, Hévécam, Kribi, and Londji.

Over 4.8 million doses of the Oral cholera vaccine have been administered in over 21 vaccination campaigns globally from 2011 to 2015 [3]. On the contrary, the oral cholera vaccine (OCV) is not well known by the population of the affected Regions. In this region, the OCV was first used in March 2020 to respond to the cholera outbreak in the Manoka health district, with a very successful result, therefore, being more cost-effective and an immediate option for cholera control and prevention [4–6]. In August 2020, the first round of the OCV campaign was done in the most affected districts of the Littoral, South, and Southwest regions. The number of cholera cases considerably reduced after this first round [5]. The second round of the vaccination had as aim to consolidate this reduction and confer longer immunity to the population. This second round took place in the context of the COVID-19 pandemic marked by rumors about the COVID-19 vaccines leading to a high rate of vaccine hesitancy and refusal. In this paper, we describe the challenges, best practices and lessons learned of the second round of the OCV vaccination campaign in Cameroon's Littoral, Southwest and South Regions.

2. Methods

2.1. Study design

This was a cross-sectional descriptive study of the mass vaccination campaigns against cholera from August to September 2020 and March 2021. The implementation was in 07 cholera-affected health districts (HDs) of the three regions namely, the Littoral, South and South-West regions. The OCV vaccines used were of two types; EvicholTM and ShancholTM. There was a strict regulation to ensure that people vaccinated received the same vaccine type in the two rounds of vaccination.

2.2. Study setting

The study was conducted in the following Health Districts (HD) and Health Areas (HA). In the Littoral Region, the HD of Bonassama (Mabanda and Bonassama HAs), New-Bell (Nkolouloun, Sebenjongo, Mbam Ewondo, New-Bell Bamiléké, Makea and Youpwe HAs), Nylon (Soboum) and Japoma (Bwang). In the South Region, the Kribi HD (Londji, Adjap, Grand-Batanga, Hevecam and Kribi HAs). In the South-West region Limbe HD (Mabeta HA) and Tiko HD (Holforth, Kange, Likomba, Missellele, Mondoni, Mudeka,

Mutegene, Tiko Town HAs). The selection of these areas resulted from a Cholera risk assessment done by WHO in 2018, and the incidence and case fatality rate in the affected areas. The objective was to sensitize 100% and vaccinate at least 95% of the target population. The target communities had an inadequate clean water supply and poor hygienic conditions with poor access to health care services. There are also islets in fishing communities with no access to a restroom. These affected zones experience an influx of the population due to the economic activities in their communities. Insecurity made access to primary healthcare services even more difficult in the southwest region, thus accounting for a double burden.

2.3. Data collection and analysis

Data were collected through tally sheets and summary sheets used by the vaccination teams in each health area. The data received were entered and analyzed using Excel 2016 software.

For the independent monitoring data and the paper collection forms, the open data kit (ODK). This ODK equally captured the geolocation of the households visited. Administrative coverages were defined as the number of doses administered divided by the number of people eligible for that vaccination, based on 2021 population estimates by the Ministry of Public Health. Individuals were asked about the occurrence of OCV adverse events following immunization (AEFI) and possible reasons for non-vaccination. We described the distribution using proportion and a 95% confidence interval.

2.4. Description of the population

The study concerned subjects aged one year and above, including pregnant women. This gave a total population for the target areas of 630,109. This population constituted five age groups: (1–4 years, 5–9 years, 10–14 years, 15–19 years, and more than 20 years. The groups were further stratified as male and female (Table 1).

Table 1

Distribution of target participants according to health circonscriptions, Cameroon.

| Region | Health district | Health area | Target population |
|-----------|-----------------|------------------|-------------------|
| Littoral | Bonassama | Mabanda | 90 713 |
| Littoral | Bonassama | Bonassama | 33 419 |
| Littoral | Japoma | Bwang | 8 614 |
| Littoral | Nylon | Soboum | 45 408 |
| Littoral | New-bell | Nkolouloun | 55 998 |
| Littoral | New-bell | Sebenjongo | 31 426 |
| Littoral | New-bell | Mbam Ewondo | 12 016 |
| Littoral | New-bell | NewBell Bamiléke | 23 285 |
| Littoral | New-bell | Makea | 30 471 |
| Littoral | New-bell | Youpwe | 3,97 |
| South | Kribi | Kribi | 62 163 |
| South | Kribi | Hevecam | 22 002 |
| South | Kribi | Grand Batanga | 11 399 |
| South | Kribi | Adjap | 4 184 |
| South | Kribi | Londji | 7 894 |
| Southwest | Tiko | Holforth | 37 698 |
| Southwest | Tiko | Kange | 4 686 |
| Southwest | Tiko | Likomba | 11 879 |
| Southwest | Tiko | Missellele | 6 323 |
| Southwest | Tiko | Mondoni | 335 |
| Southwest | Tiko | Mudeka | 10 349 |
| Southwest | Tiko | Mutengene | 54 095 |
| Southwest | Tiko | Tiko town | 21 868 |
| Southwest | Limbe | Mabeta | 6 899 |

3. Results

3.1. Vaccine coverage

3.1.1. The vaccine coverage with two doses

See Fig. 1

3.1.2. Vaccination coverage by gender and age group

Data analysis by age group was done for 6 out of 7 districts: Japoma, Bonassama, New-Bell, Nylon, Kribi, and Tiko. The District of Limbe did not use the data collection tools that included gender, so its data is not included in this section.

For all age groups, vaccination coverage for females (66%) was higher than for males (60%). Vaccination coverage was highest for the 5–9-year-old age group for both genders, while children under five years old have the lowest coverage. The table below presents the vaccination coverage by gender and age group for the six districts mentioned above.

The graph below illustrates the number of people vaccinated by age group and sex, showing that the number of women vaccinated is higher than that of men (see Fig. 2).

3.1.3. Geographical distribution of the vaccination coverage

See Fig. 3.

3.2. Individuals with vaccination cards among vaccinated

During the monitoring, the overall proportion of vaccinated persons possessing an immunization card was above 80% in the seven districts. The lowest rate was recorded in the Kribi health district, where 18% of the people vaccinated did not have an immunization card for various reasons that were not documented in this study.

3.3. The main reason for non-vaccination

In all the districts, from the sampled participants during the independent monitoring, the main reason for non-vaccination is refusal (67%), followed by absence during the door to door visit (15%) and failure to visit some homes by the vaccinators (13%). With regard to refusals, the table below shows that most of these people raise the worry of immunization security (Fig. 4) (see Tables 2–4).

3.4. Adverse events following immunization (AEFI)

They were 13 minor AEFI recorded during this campaign (from day 1 to Day 6 of the implementation phase). The symptoms were either vomiting and/or diarrhea following administration of the OCV. The cases were documented and managed in the nearest health facilities (Table 5).

3.5. Challenges, best practices, and lessons learned

3.5.1. Challenges

We have decided for the purpose of this paper to focus on the littoral region and more specifically the urban area of Douala for two main reasons. First, Douala alone represented more than 80% of the targeted population and second there was an improved overall coverage in Douala during the second round of the campaign moving up from 38.61% to 53.95%; though a marked progress, it was below the 95% target set as an objective.

3.5.1.1. Target populations' perceptions in the delivery of OCV interventions. The Oral Cholera Vaccination (OCV) campaign in the Littoral region targeted 366,320 people aged one year and above in 10 health areas and four health Districts. This vaccination took place in the context of the COVID-19 pandemic, with many people being reluctant to receive any vaccine. It should be noted that in the past, people had not heard of vaccination against cholera and vaccination of adults. Therefore, most targets thought this was an indirect way of giving them the COVID-19 Virus. This was the first misconception of the population that led to a high refusal rate. Moreover, the controversial debates on vaccines in general and the COVID-19 vaccines, in particular, taking place over the media have convinced many people not to accept any vaccine.

3.5.1.2. Reasons for non-vaccination/ Reasons for partial and non-acceptance of the vaccination. The main reason for non-vaccinations was refusal. The end process monitoring at the end of the campaign found out that the reasons for refusal were the fear that the vaccine may be dangerous (46%), some said they were already wholly vaccinated (6%), some women said they were not the ones to decide (8%). Others said they were sick and could not take the vaccine (1%). Some refused because of religious reasons (4%), while about 33% gave no reason for refusal.

Another reason for refusing of vaccination of the OCV was the fear of being administered the COVID-19 vaccine instead of cho-

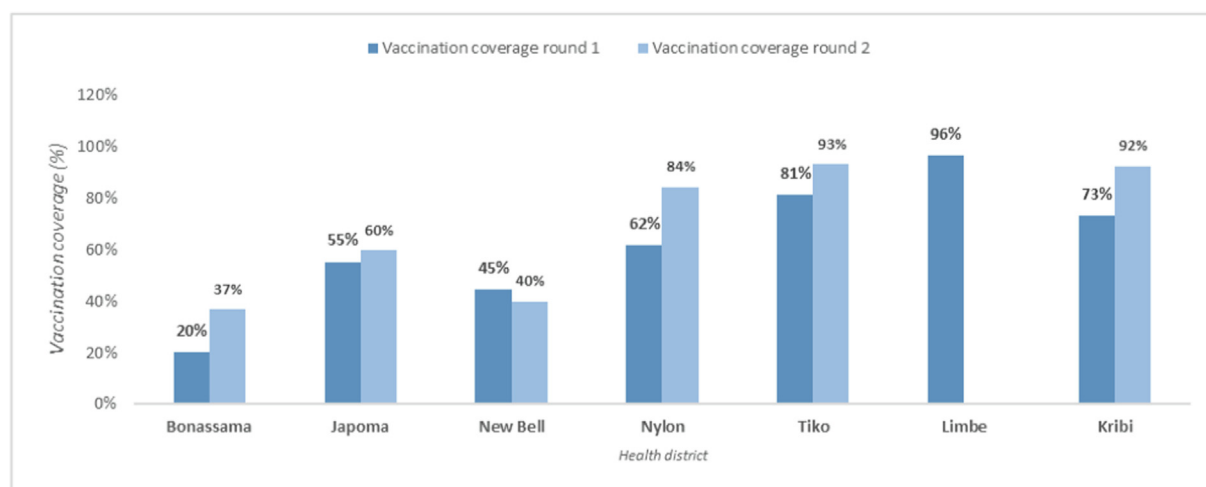


Fig. 1. Comparison of the results of the first and second round.

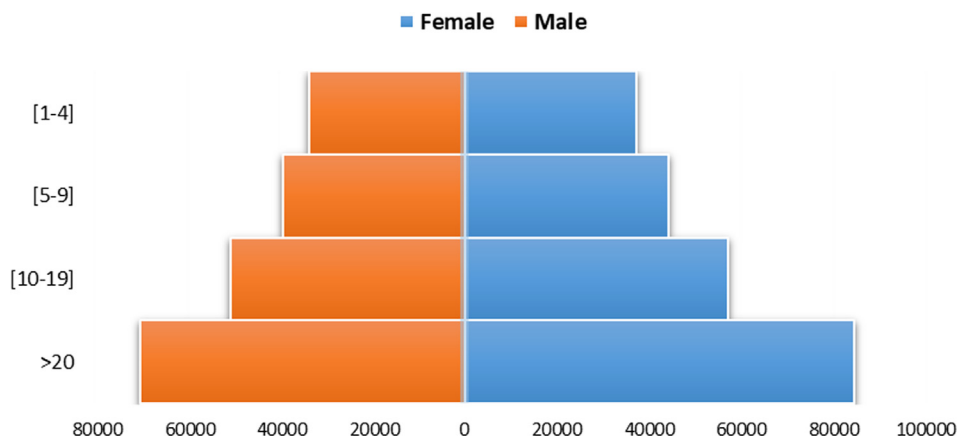


Fig. 2. Distribution of vaccinated people by age group and gender.

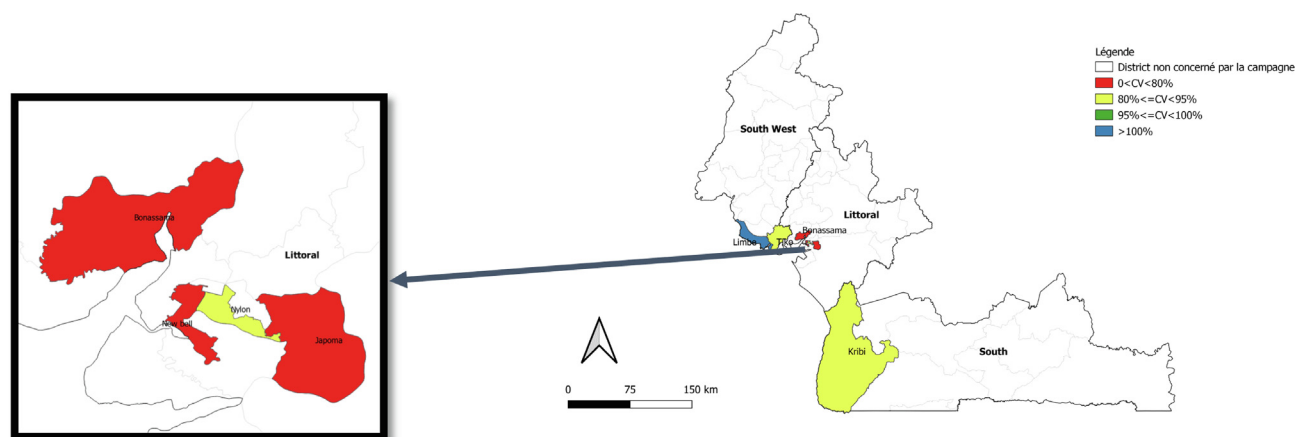


Fig. 3. Cartography of vaccination coverage per district.

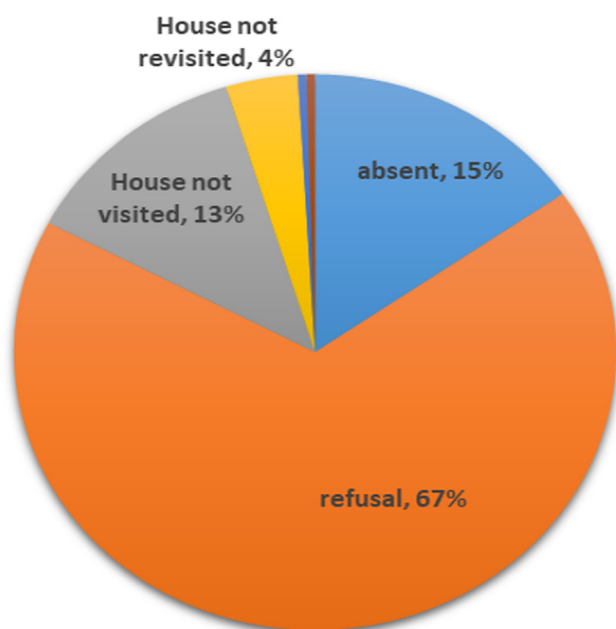


Fig. 4. Mains raisons of non-vaccination in the 7 health districts.

lera. Some adults refused because they say they do not need the vaccines, which they believe are for children. In communities like Mabanda, health areas with deplorable hygienic conditions and inadequate road networks, some inhabitants were reluctant to take the vaccine, according to them; the government should instead improve their sanitary needs and road network than giving “unnecessary vaccines.” The misconceptions on vaccines currently potentiated by fake news over the Internet had a negative impact on the OCV campaign in the littoral region. This could be observed in health areas like in Youpwe, wherein church, the person reading the announcement concerning the campaign, instead of saying vaccination campaign against “**cholera**,” mistakenly said vaccination campaign against “**chorona**.” Despite the training given to the mobilizers and vaccinators, some found it challenging to transmit the essential information concerning the vaccine. In addition, some health personnel were not convinced that vaccines are important in preventing diseases, propagating negative information to their clients, and their entourage. This finding is in the same line as a study carried out in 2014, where about 43% of medical doctors do not recommend vaccination to their patients. [10,11].

3.5.2. Best practices

Out of the 158,020 people sensitized, 6434 were reluctant. Despite the reasons mentioned above, and building on the lessons learned from the first round, 43.86% of reluctant people were

Table 2

Distribution of vaccinated according to age and gender.

| Charactetistics | [1–4] | [5–9] | [10–19] | >20 | Total |
|-----------------|------------|------------|------------|------------|-------|
| Female | 52% | 90% | 72% | 62% | 66% |
| Male | 49% | 83% | 66% | 53% | 60% |
| Total | 51% | 87% | 69% | 58% | 63% |

Table 3

Proportion of individuals showing the vaccination card among vaccinated.

| | | Vaccination Cards available | |
|-----------|-----------|-----------------------------|-----|
| | | Yes | No |
| Littoral | Bonassama | 95% | 5% |
| | Japoma | 94% | 6% |
| | New Bell | 85% | 15% |
| Sud-ouest | Nylon | 84% | 16% |
| | Limbe | 99% | 1% |
| | Tiko | 93% | 7% |
| | Kribi | 82% | 18% |
| Total | | 89% | 11% |

finally convinced to take the vaccine.. For the second round, communications methods were improved and intensified to sensitize the population. Bloggers and journalists were trained to conduct mass sensitization on the Internet and over the various media (local and national radio; television, newspapers, and even international press). Some community, religious, and administrative leaders were equipped and sensitized in their various communities. We equally performed a close-supervision, where supervisors went to the different health areas to sensitize and vaccinate the population.

3.5.2.1. Comparison of refusal rate data and reasons, from the first to the second round. The refusal rate for the second round was lower than the first. This can be explained by the fact that during the first round little was known by the populations concerning the cholera vaccine. In addition, the context of the COVID-19 Pandemic had a negative impact, as many people were scared and thought it was a disguised way for the government to inoculate the COVID-19 Virus to them.

With intensified communication, people who refused during the first round accepted during the second round. With the involvement of the media and the Internet, many people were sensitized to the importance of this vaccination. Moreover, some traditional leaders also helped in sensitizing and vaccinating their population. All the supervisors went to the field to sensitize and led by examples by taking their vaccines sometimes several times in front of the people.

3.5.2.2. The particularity of the COVID-19 context during the cholera campaign period. The door to door mass vaccination campaign took place in the context of COVID-19. All the actors were tested, and

positive cases were managed and replaced. New actors; tested negative for Covid-19 immediately replaced those who were tested positive. This last minutes change of actors has automatically negatively influenced the campaign because the new actors needed more time to master their duties.

3.5.3. Lessons learned

The second round of the OCV campaign in the littoral was more successful than the first. We learned some lessons in order to improve the coverage during the next campaigns: communications concerning vaccination campaigns should start about one month before the beginning of the campaign. Community, administrative and religious leaders should be highly involved in public health activities. The selection of mobilisers and vaccinators should be done considering some well-defined criteria. Communications tools like banners, badges, flyers, T-shirt are very important to convey the right information and build trust in communities.

4. Discussion

This article describes vaccination coverage, challenges, best practices, and lessons learned during the second round of OCV vaccination coverage in the Littoral, South, and South-West regions in Cameroon in March 2021.

We observed an 80.4% overall coverage for this campaign, a marked increase from the 64% recorded during the first round in August 2020. It is similar to results obtained in Guinea in 2012 and in South Sudan in 2016 [12,13,16]. This can be explained by the fact that the population had already had the first dose and, as such, were more confident of receiving the second dose. The second round took place in better climatic conditions (less rain) than the first, enabling a better field implementation. We also had a more significant media visibility and messages done and broadcast in the local languages of the people. There was 16% increase in coverage, specifically in littoral and south regions, which saw a leap from 38.61% to 53.95% and 72.74% to 94.07%. In the South-West region that experienced a double threat of insecurity associated to COVID-19 pandemic, we also saw an increase in vaccination coverage from 81.97% to 93.30%. Sensitization had begun in this region a month before the start of vaccination. This was via local radio stations. One of the reasons explaining this significant disparity among regions might be the superiorly urban aspect of the Littoral region coupled with the high density of its population living in the slums.

Table 4

Main reasons of refusal in the 7 health districts.

| | | Religion | Not me who decides | Unsafe Vaccine | No answer | Side effects | Fully vaccinated | Others |
|-----------|-----------|----------|--------------------|----------------|-----------|--------------|------------------|--------|
| Littoral | Bonassama | 0% | 0% | 57% | 14% | 0% | 25% | 3% |
| | Japoma | 0% | 35% | 65% | 0% | 0% | 0% | 0% |
| | New Bell | 0% | 8% | 38% | 47% | 3% | 0% | 3% |
| | Nylon | 0% | 6% | 44% | 41% | 0% | 0% | 9% |
| Southwest | Tiko | 3% | 13% | 17% | 67% | 0% | 0% | 0% |
| South | Kribi | 6% | 8% | 66% | 18% | 2% | 0% | 0% |
| Total | | 1% | 9% | 47% | 33% | 2% | 4% | 3% |

Table 5

Distribution of AEFI among vaccinated people during the OVC mass vaccination campaign in March 2021 in Cameroon.

| DISTRICTS | Day 1 | Day 2 | Day 3 | Day 4 | Day 5 | Day 6 | TOTAL |
|-----------|-------|-------|-------|-------|-------|-------|-------|
| BONASSAMA | 0 | 1 | 0 | 2 | 0 | 1 | 4 |
| NEW-BELL | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NYLON | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JAPOMA | 0 | 1 | 0 | 1 | 0 | 0 | 2 |
| TIKO | 1 | 1 | 1 | 0 | 0 | 0 | 3 |
| KRIBI | 1 | 1 | 1 | 1 | 0 | 0 | 4 |
| TOTAL | 2 | 4 | 2 | 4 | 0 | 1 | 13 |

The vaccination coverage for this second round was 66% among women compared to 60% for their male counterparts. This is similar to results obtained in Zanzibar and Haiti in 2012 and 2013, respectively, where OCV uptake was greater in aged females and residents of rural areas [13–15]. The highest coverage (87%) was recorded in the 5–9 years group, which is the group reported to benefit the most from the OCV campaign. Amid vaccine hesitancy in the COVID-19 pandemic era, the population of zero to nine years is the usual target for childhood immunization in Cameroon. This younger population continues to be more receptive to immunization than the adult population to whom vaccination is novel in this context. The older population worries about the safety and efficacy of new vaccines like the one against COVID-19 and are hesitant to take all the vaccines. This observation might explain the lower vaccination coverage in this group.

In all the districts, the main reason for non-immunization was refusal (67%). The population enumerated; religion, not being the persons to decide about family or personal health as the main reasons for refusal. Others mentioned vaccine safety and/or side effects as support for refusals. These findings are different from those found in surveys carried out between 2006 and 2012 in the United States of America [7–9]; this can be explained by the fact that the level of misconception and misinformation concerning vaccinations was not high in this period the present COVID-19. Despite our best efforts to educate parents about the effectiveness of the vaccine, some will decline to have their children vaccinated. In addition, the lowest coverage occurred in the districts of Douala (littoral region). These districts are among those with significant challenges related to the demand and utilization of immunization services in urban areas in Cameroon. This region is among the country's least ranked for COVID-19 vaccination and routine immunization coverage.

Since the strategies revolved door-to-door in the communities and fixed in the health facilities, failure to be immunized was due to home absence (15%) and inability to visit certain homes (13%). These last two reasons, which represent 28%, reflect a programmatic problem in the planning of the vaccination campaign.

They were mild (vomiting, nausea, diarrhea) adverse effects following immunization (AEFI), 13 of them were recorded in all the 07 health districts with both the Shanchol and Euvichol OCV. This means that the OCV might be safe, as reported by other studies done in low and middle-income countries [12,15].

One major lesson learned in this campaign was that intensifying communication and anticipating hesitancy linked with COVID-19 vaccination activities several weeks before the implementation could improve the vaccination uptake and help the government reach its goal of addressing mortality due to cholera.

Another lesson learned was screening all actors taking part in vaccination against COVID-19 before the actual campaign begins. For this reason, we recommend that the next campaign proceeds with the screening before the training of these actors, and this training must be conditioned by the presentation of a recent COVID test. This will not only limit the spread of COVID-19 within the community but also allow for better ownership of individual duties and consequently better results.

5. Conclusion

The second round of the reactive mass oral cholera vaccination campaign was carried out in three regions of Cameroon in March 2021 amidst the launch of COVID-19 vaccination. Despite the context of great vaccine hesitancy, this campaign was a success. This finding proves that the right and targeted communication will always brave the odds of unwillingness to vaccination and consolidate milestones acquired by vaccinating the masses. It also brings to light new methods of reaching out to the population via social media, the same channels used for misinformation. Appropriate information will subsequently be the way to thwart hesitancy and consolidate herd immunity.

Authors' contribution

All authors have read and agreed to the published version of the manuscript.

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CRediT authorship contribution statement

Adidja Amani: Conceptualization, Methodology, Validation, Supervision, Data curation, Investigation, Project administration, Writing – review & editing. **Solange Ngo Bama:** Methodology, Validation, Writing – original draft, Writing – review & editing. **Mariette Dia:** Validation, Writing – review & editing. **Skinner Nguefack Lekelem:** Validation, Writing – original draft, Writing – review & editing. **Abdou Linjoum:** Validation, Writing – review & editing. **Hans Mossi Makembe:** Validation, Writing – original draft, Writing – review & editing. **Andreas Ateke Njoh:** Validation, Writing – review & editing. **Fabrice Zobel Cheuyem Lekeumo:** Validation, Writing – review & editing. **Serge Eyebe:** Validation, Data curation, Writing – review & editing. **Georges Nguefack-Tsague:** Validation, Writing – review & editing. **Joseph Kamgno:** Validation, Writing – review & editing.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: [Adidja Amani reports administrative support was provided by Ministry of Public Health. Adidja Amani reports a relationship with Ministry of Public Health that includes: employment].

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