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ORIGINAL ARTICLE

Oral cholera vaccine uptake, acceptance and confidence among residents of a high-risk township in Zambia: key insights for future vaccination programs

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Background: Oral cholera vaccines (OCVs) prevent cholera and save lives. Given the recent 2024 country-wide cholera epidemic in Zambia, we determined self-reported OCV uptake, acceptance and confidence among adults living in a high-risk, cholera-prone township in Zambia.

Methods: A descriptive cross-sectional study was conducted from April to August 2024, involving 385 randomly selected adult participants residing in the Kanyama township of Lusaka, Zambia. Data were collected using an interviewer-administered questionnaire and statistically analysed.

Results: Self-reported uptake of at least one dose of the OCV was 18%, with the majority (315 [82%]) reporting being unvaccinated against cholera. Among those who were unvaccinated, vaccine acceptance was <10% (95% confidence interval [CI] 6.8 to 13.7), with higher rates reported among women than men (p=0.002). Despite this, the majority (210 [84.3%]) expressed confidence in the vaccination program. Those knowledgeable about the OCV were twice as likely to get vaccinated (adjusted odds ratio 2.60 [95% CI 1.19 to 5.68]). Knowledge, attitudes and perceptions were associated with OCV uptake.

Conclusions: Self-reported OCV uptake and acceptance were low in a high-risk cholera-prone township in Zambia. Community education on the benefits of the vaccine is urgently needed to enhance confidence and attitudes towards the OCV and improve vaccination rates in the future.

Keywords: acceptance, confidence, hesitancy, oral cholera vaccine, uptake, vaccination.

Introduction

Cholera remains endemic in many low- and middle-income countries (LMICs) and disproportionately affects the poorest populations and communities.[1] The World Health Organization (WHO) recommends mass vaccination with at least two doses of the oral cholera vaccine (OCV) alongside water, sanitation and hygiene (WASH) strategies to reduce the burden in cholera-endemic areas.[2] However, due to the ongoing global vaccine shortage, most countries use only a single-dose vaccination regimen to ensure that as many people are vaccinated as possible.[2] Studies conducted in Africa suggest that early vaccination with a single dose of the Shanchol vaccine offered a high degree of protection against cholera.[3,4] Mass immunization protects vaccinated individuals and provides herd immunity to the unvaccinated against cholera.[5]

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Despite interventions, cholera cases have continued to increase in Africa since 2021.[6] Ranked among the top 10 African countries where cholera outbreaks regularly recur, Zambia contributed approximately 6% of all cholera cases in Africa between 2022 and 2024.[7] The recent 2023–2024 cholera epidemic that affected Zambia's 10 provinces, with confirmed outbreaks in 58 of 116 districts, started in Lusaka, the capital city of Zambia.[8] The Zambian government has been implementing mass vaccination campaigns since 2018, administering approximately 2 million doses of the Shanchol vaccine in January and February 2018 to at-risk populations >1 y of age in Lusaka.[3,9] During the 2023–2024 outbreak that resulted in 1900 deaths in the 112 301 cholera cases reported in Zambia, a stockpile of approximately 4 million doses of OCV was secured by the Zambian government to control the outbreak as part of the mitigation response.[10] While official reports by the WHO indicated that OCV coverage was >1.7 million people during a vaccination campaign following the 2023 cholera outbreak declared in Lusaka's hotspot areas,[10] a concern arose whether all vulnerable population groups were adequately reached during the intervention. This follows previous studies in Zambia highlighting concerns regarding the limited number in some population groups who actually receive a second dose of the OCV,[11] in addition to concerns with vaccine hesitancy due to misinformation.[12]

With OCVs increasingly becoming an integral part of preventive and control measures for cholera across LMICs, a question that arose was whether vaccine hesitancy and confidence are issues of concern in Zambia, as seen recently with other vaccines.[13,14] As defined by Bussink-Voorend et al.,[15] vaccine hesitancy is a psychological state of indecisiveness people experience when making a decision regarding vaccination. This is often reinforced by misinformation surrounding vaccines in general, which is an important issue affecting the success of vaccination programs in several countries.[16] Vaccine confidence is a term that describes individual and community perceptions about the vaccine's effectiveness and safety, including public trust in the vaccination program.[16] This is another key issue across Africa.[13] Non-acceptance, hesitancy and refusal of OCV have been reported in African countries, including Zambia, which is a concern.[12] Consequently, low vaccine uptake in communities may compromise public health efforts to achieve herd immunity, prolonging the epidemic's effects on socio-economic stability and economic costs.[17,18] This study aimed to determine uptake of the OCV and confidence in vaccination in a population residing in a cholera-prone township in Zambia. We believe this study is key to understanding current drivers affecting vaccination rates in high-risk populations, given the previous concerns in Zambia.[11,12] The findings can provide evidence-based recommendations to enhance cholera immunization coverage and safeguard public health in Zambia and beyond.

Methods

Study design and setting

We conducted a descriptive, cross-sectional study in Kanyama township, an unplanned, high-density, peri-urban settlement in Lusaka. According to the 2022 national census report, Kanyama had a population of approximately 526 418 people distributed in six settlement areas.[19] Kanyama was chosen due to its significant contribution to the 2023–2024 cholera outbreak, stemming from its status as one of Zambia's most cholera-prone areas with poor sanitation and contaminated water from untreated shallow wells.[20] Thus if there were any concerns regarding cholera vaccinations in Lusaka, residents of Kanyama represented an ideal target population. The study was conducted from April to August 2024, 6 months after the cholera epidemic response that commenced in October 2023.

Study population, sample size and sampling

The target population included adults ≥18 y of age residing in Kanyama township. A sample size was determined using Cochran's formula: $n=z^2*P*(1-P)/e^2$, where z=1.96 corresponding to a 95% confidence interval (CI), P=50% proportion of the population assumed to be vaccinated and e=5% margin of error. The minimum calculated sample size was 385 participants. Systematic random sampling was used to recruit the participants. The sampling frame was adult residents accessing the Kanyama level 1 hospital during the study period.

Variables

Outcome variables of interest included self-reported cholera vaccination status and OCV acceptance if offered the vaccine. The sociodemographic variables were measured as exposures and potential predictors, while knowledge, attitudes and perceptions of the OCV were measured as potential effect modifiers.

Data collection instrument and measurements

We deployed a structured interviewer-administered questionnaire that comprised closed-ended questions in five sections: sociodemographic characteristics, cholera vaccination status, basic knowledge (what is known) about OCV, attitudes (what is thought) towards OCV and perceptions (concerns) about OCV. Vaccine uptake, acceptance and confidence were measured on a nominal scale of 'yes' or 'no' to the following questions: 'Are you vaccinated against cholera?' 'If not vaccinated, would you accept taking the oral cholera vaccine if available?' and 'Do you have confidence in the vaccine and support the cholera vaccination campaigns and programmes?'. To measure knowledge and attitudes towards OCV, a summative score was assigned, building on previous related studies[21,22] and given that no piloting of the tool was done. In the knowledge assessment, participants were asked a total of five questions, and a score ≥3 correct responses was categorised as 'knowledgeable = 1', whereas those with <3 correct responses were 'not knowledgeable = 0'. This criterion was similar to a related study.[21] Similarly, to assess attitudes, four questions were asked, and a score ≤2 correct responses was assigned as 'poor attitude = 0' while ≥3 correct responses was assigned 'good attitude = 1'. This is similar to a related study.[22] See the full questionnaire in the Supplementary Information.

Table 1. Sociodemographic characteristics of the participants.

Characteristics	n (%)	Cholera vaccination status		
		Unvaccinated, n (%)	Vaccinated, n (%)	p-Value[a]
Age group (years)				
<30	191 (49.6)	154 (48.9)	37 (52.9)	NS
30–40	110 (28.6)	89 (28.3)	21 (30.0)	
>40	84 (21.8)	72 (22.9)	12 (17.1)	
Marital status				
Married	191 (49.6)	157 (49.8)	34 (48.6)	NS
Unmarried	194 (50.4)	158 (50.2)	36 (51.4)	
Sex				
Female	228 (59.2)	183 (58.1)	45 (64.3)	NS
Male	157 (40.8)	132 (41.9)	25 (35.7)	
Highest level of education				
Primary	124 (32.2)	105 (33.3)	19 (27.1)	NS
Secondary	21 (5.5)	17 (5.4)	4 (5.7)	
Tertiary	240 (62.3)	193 (61.3)	47 (67.1)	
Employment status				
Employed	109 (28.3)	95 (30.2)	14 (20.0)	NS
Unemployed	276 (71.7)	220 (69.8)	56 (80.0)	
Religion				
Christian	385 (100.0)	315 (81.8)	70 (18.2)	–

NS: not statistically significant.
Of the 385 participants, the table shows that the majority were unvaccinated across the demographic characteristics.
[a]Pearson χ^2 or Fisher's exact test as appropriate.

Data analysis

Frequencies and percentages were calculated for categorical variables. Pearson's χ^2 test with Yate's correction and Fisher's exact test were used to determine associations between vaccination status, knowledge and attitudes toward OCV and the sociodemographic variables. A backwards, stepwise multivariate logistic regression analysis was used to determine factors associated with OCV uptake and vaccination acceptance, with an adjusted odds ratio (aOR) accounting for predictor variables and interactions in the model. To construct the regression model, all potential predictors were included, and those variables not statistically significant or contributing little to the model's predictive accuracy were iteratively removed. The least significant variable was removed at each iterative step and the model was refitted without that variable until all the remaining variables were statistically significant. A two-tailed p-value <0.05 was considered to be statistically significant at a 95% CI. Data were analysed using Stata version 14 (StataCorp, College Station, TX, USA).

Results

Participant's demographic characteristics

Table 1 shows the demographic characteristics and cholera vaccination status of the 385 participants, the majority of whom were female (228 [59.2%]), 191 (49.6%) were <30 y of age and 194 (50.4%) were unmarried. The majority (240 [62.3%]) had attained a tertiary level of education and 276 (71.7%) were unemployed.

Cholera vaccine uptake, acceptance, confidence, knowledge, attitudes and perceptions

Overall, a majority (315 [81.8%]) reported they were unvaccinated against cholera. Regarding self-reported vaccination status, the uptake of OCV was 18.2% (95% CI 14.5 to 22.4). All (100%) vaccinated individuals received a single dose. The uptake of OCV was numerically higher among women (19.7% [95% CI 14.8 to 25.5]) versus men (15.9% [95% CI 10.6 to 22.6]). The overall vaccine acceptance was 9.8% (95% CI 6.8 to 13.7), with the highest among women at 13.7% (95% CI 9.0 to 19.5) compared with men at 4.5% (95% CI 1.7 to 9.6). This difference was statistically significant (p=0.002).

Table 2 shows the knowledge, attitudes and perceptions of the OCV among 249 participants stratified by sex and vaccination status. Overall, among the 249 participants who responded to the knowledge, attitudes and perception questions, more than half (148 [59.4%]) demonstrated relatively good knowledge about OCV. The majority (240 [96.4%]) reported that the OCV was beneficial for public health. A total of 137 (55.0%) participants knew that taking OCV did not guarantee lifelong protection from cholera and 138 (55.4%) knew that OCV was a valuable tool for preventing cholera outbreaks when used in conjunc-

Table 2. Knowledge, attitudes and perceived risks of OCV among participants.

Characteristics	Question/statement	Level	Total, n (%)	Women, n (%)	Men, n (%)	p-Value
Knowledge about OCV	The oral cholera vaccine is given to people living in areas at risk of cholera outbreaks.	Disagree Agree	7 (2.8) 242 (97.2)	2 (1.5) 136 (98.6)	5 (4.5) 106 (95.5)	NS
	All age groups can receive the oral cholera vaccine.	Disagree Agree	110 (44.2) 139 (55.8)	52 (37.7) 86 (62.3)	58 (52.3) 53 (47.8)	0.02
	The cholera vaccine can prevent someone from contracting cholera for a few years.	Disagree Agree	112 (45.0) 137 (55.0)	53 (38.4) 85 (61.6)	59 (53.2) 52 (46.9)	0.02
	The cholera vaccine is used with other public health measures to prevent cholera.	Disagree Agree	111 (44.6) 138 (55.4)	68 (49.3) 70 (50.7)	43 (38.7) 68 (61.3)	NS
	Vaccination against cholera is beneficial for public health.	Disagree Agree	9 (3.6) 240 (96.4)	2 (1.5) 136 (98.6)	7 (6.3) 104 (93.7)	0.04
	Level	n (%)	Cholera vaccination status			
			Unvaccinated, n (%)	Vaccinated, n (%)		p-Value[a]
Knowledge score	<3/5 (Not knowledgeable) ≥3/5 (Knowledgeable)	101 (40.6) 148 (59.4)	88 (48.9) 92 (51.1)	13 (18.8) 56 (81.2)		<0.0001
Attitude toward OCV	Question/statement	Level	Total, n (%)	Females, n (%)	Males, n (%)	p-Value
	Taking the oral cholera vaccine is important for my health	No Yes	13 (5.2) 236 (94.8)	6 (4.4) 132 (95.7)	7 (6.3) 104 (93.7)	NS
	Fear taking the cholera vaccine	No Yes	127 (51.0) 122 (49.0)	61 (44.2) 77 (55.8)	66 (59.5) 45 (40.5)	0.02
	Encourage family/friends/neighbours to take the cholera vaccine	No Yes	27 (10.8) 222 (89.2)	11 (8.0) 127 (92.0)	16 (14.4) 95 (85.6)	NS
	Confidence in the vaccine and support cholera vaccination campaigns and programmes	No Yes	39 (15.7) 210 (84.3)	17 (12.3) 121 (87.7)	22 (19.8) 89 (80.2)	NS
	Level	n (%)	Cholera vaccination status			
			Unvaccinated, n (%)	Vaccinated, n (%)		p-Value*
Attitude score	≤2/4 (Poor) ≥3/4 (Good)	53 (21.3) 196 (78.7)	49 (27.2) 131 (72.8)	4 (5.8) 65 (94.2)		0.0004
Perceptions of OCV	Question/statement	Level	Total, n (%)	Females, n (%)	Males, n (%)	p-Value
	Perceive the cholera vaccine as unsafe	No Yes	232 (93.2) 17 (6.8)	127 (92.0) 11 (8.0)	105 (94.6) 6 (5.4)	NS
	Perceive the cholera vaccine can be harmful to one's health in future	No Yes	235 (94.4) 14 (5.6)	131 (94.9) 7 (5.1)	104 (93.7) 7 (6.3)	NS
	Perceive that, generally, few vaccines used in Africa are effective	No Yes	198 (79.5) 51 (20.5)	89 (80.1) 22 (19.8)	109 (79.0) 29 (21.0)	NS

NS: not statistically significant.
Among the 249 responses to the knowledge, attitudes and perceptions assessment, there were statistically significant differences in OCV knowledge between men and women. Vaccination status was statistically significantly associated with OCV knowledge and attitudes level.
[a] χ^2 test with Yates correction.

Table 3. Factors influencing vaccine uptake among the participants.

Characteristic	Crude OR (95% CI)	p-Value	aOR (95% CI)	p-Value
Age	0.95 (0.95 to 1.01)	NS	0.99 (0.96 to 1.02)	NS
Marital status				
Married	Ref	NS	NA	NA
Unmarried	1.05 (0.63 to 1.77)			
Sex				
Female	Ref	NS	NA	NA
Male	0.77 (0.45 to 1.32)			
Highest level of education				
Primary	Ref	NS	NA	NA
Secondary	1.30 (0.39 to 4.29)	NS		
Tertiary	1.35 (0.75 to 2.41)			
Employment				
Employed	Ref	NS	1.88 (0.93 to 3.80)	NS
Unemployed	1.73 (0.92 to 3.25)			
Knowledge of OCV				
Not knowledgeable	Ref	<0.001	Ref	0.02
Knowledgeable	4.12 (2.11 to 8.06)		2.60 (1.19 to 5.68)	
Attitude towards OCV				
Negative	Ref	0.001	Ref	NS
Positive	6.08 (2.10 to 17.57)		2.92 (0.87 to 9.84)	
Perceived the vaccine as unsafe				
No	Ref	NS	NA	NA
Yes	0.21 (0.03 to 1.62)			
Perceived the vaccine as harmful to health				
No	Ref	0.02	NA	NA
Yes	0.09 (0.01 to 0.68)			
Perceived that generally few vaccines used in Africa are effective				
No	Ref	<0.001	Ref	0.008
Yes	0.15 (0.06 to 0.39)		0.26 (0.09 to 0.69)	

The adjusted regression model revealed that knowledge of OCV and perception of vaccines in Africa as unsafe were predictors of uptake.
NA: not added in the model; NS: not statistically significant.

tion with other public health measures. In terms of attitude, 196 (78.7%) indicated a positive attitude towards OCV. About half (127 [51.0%]) indicated they would take OCV without any fear and 222 (89.2%) would encourage their family, friends and neighbours to take the vaccine. There was a statistically significant association between vaccination status, OCV knowledge (χ^2=17.5, p<0.0001) and attitude (χ^2=12.4, p=0.0004). In addition, a majority (210 [84.3%]) had confidence in the vaccine and supported cholera vaccination campaigns, with the majority (87.7%) being females. Regarding any perceived risks, only 17 (6.8%) felt the vaccine was unsafe, 14 (5.6%) indicated the vaccine was potentially harmful to one's health and 51 (20.5%) felt there were generally few effective vaccines used in Africa.

Factors associated with OCV uptake

Table 3 shows the predictors of OCV uptake. From the unadjusted logistic regression model, factors associated with vaccine uptake included knowledge, attitudes and perceptions. The multivariable analysis showed that being knowledgeable about OCV was associated with uptake. Participants knowledgeable about OCV were twice as likely to get vaccinated (aOR 2.60 [95% CI 1.19 to 5.68]). Conversely, participants who perceived that generally few vaccines used in Africa are effective were less likely to get vaccinated against cholera (aOR 0.26 [95% CI 0.09 to 0.69]).

Discussion

Since the rollout of OCV as part of the cholera mitigation strategy in Zambia, we believe this is the first study to quantify the self-reported uptake and acceptance of OCV in a cholera hotspot of Lusaka. This builds on previous studies in Zambia.[11,20] We found a high proportion (82%) of participants in Kanyama township reporting being unvaccinated against cholera. In our study, self-reporting receiving at least a single dose of the OCV, as a measure of vaccine uptake and vaccination status, was low (18%) compared with nearly half (49.7%) in Zanzibar, Tanzania[23] and slightly more than half (55%) in Uvira, Democratic Republic of the

Table 4. Suggested activities and actions for stakeholders in Zambia to address OCV uptake and acceptance.

Stakeholder group	Suggested activities and actions to address OCV hesitancy	Rationale based on findings
National authorities responsible for health (Ministry of Health and Zambia National Public Health Institute)	Develop population-specific targeted educational interventions and campaigns to improve OCV and cholera prevention knowledge.	Our findings suggest that knowledge was associated with higher OCV uptake; therefore, leveraging healthcare workers' roles in increasing awareness may address misconceptions and improve vaccination acceptance.
	Integrate cholera vaccination into routine immunisation programs. Ensure optimal planning for OCV availability and access at public healthcare facilities for all. Localise vaccine production, address structural barriers such as regulatory bottlenecks, cold chain logistics and vaccine delivery strategies, including vaccine accessibility, and geographical access to vaccination sites to ensure equitable access.	Low OCV uptake may also suggest limited access to the vaccine; therefore, addressing barriers to routine vaccine availability through the public supply chain could address this and improve coverage, particularly in high-risk settlements.
Community and civic leaders	Community leaders should be empowered with the capacity and information to conduct community dialogues focusing on vaccine confidence and promoting positive attitudes towards vaccination.	Despite low acceptance, our study found that most participants expressed confidence in the OCV and vaccination programme. This can be leveraged on.
	In addition, organise gender-sensitive awareness initiatives to engage women and promote their participation in vaccination efforts as social network champions.	Women showed higher vaccination acceptance, making them potential influencers for community-level behaviour change.
Healthcare professionals	Provide training and CPD on effective communication strategies to address vaccine hesitancy and misconceptions.	Healthcare professionals can influence perception and attitude, which are important predictive factors influencing OCV uptake, as shown with other vaccines.[11]
	Conduct community outreach programs to ensure inclusion of vulnerable and hard-to-reach populations at risk of cholera	Equitable access to vaccination services may improve uptake rates in underserved groups, given that the OCV is given free of charge in Zambia.
Education institutions	Being a contextual and endemic problem in Zambia, cholera prevention and OCV awareness lessons should be incorporated into the school curricula and community education initiatives across the different population groups.	Educating populations (especially the youth) can contribute to sustained improvements in knowledge, attitude, and perception
Non-state actors, civil society organisations, community-based organisations, and advocacy groups	Non-state actors can develop and implement social marketing and advocacy campaigns in high-risk communities, focusing on the importance of cholera vaccination, WASH and other preventive health measures.	Advocacy and social marketing are powerful tools to address social barriers and perceptions linked to the uptake of vaccination programmes.[14]
	In addition, collaborate with local community-based organisations, civic and community leaders through initiatives to create demand for OCV and disseminate cholera vaccination and prevention information, including addressing misinformation at the grassroots level.	Targeting demand creation, health information updates and dissemination at the grassroots level ensures information reaches diverse communities, including those with limited access to mainstream healthcare systems.

Table 4. Continued

Stakeholder group	Suggested activities and actions to address OCV hesitancy	Rationale based on findings
Researchers and research organisations	Conduct further studies to explore contextual barriers to vaccine acceptance and identify tailored interventions for specific demographic groups. Innovate vaccine delivery methods that increase access and coverage.	Our findings suggest gaps in knowledge, attitudes and perceptions. This warrants deeper analysis that could support evidence-based strategies for improving OCV coverage.

Based on the findings of this study, each key stakeholder group has a role to play in addressing OCV hesitancy in Zambia.

Congo (DRC).[24] Moreover, we did not find a high demand for OCV among the adult participants in Kanyama. Arguably, sociocultural and personal perceptions influenced these decisions. Since OCV is not routinely available at public healthcare facilities in Zambia, except during cholera vaccination campaigns when an outbreak looms, this limited access and availability of the vaccine possibly affected uptake. Our OCV uptake findings were based on self-reported vaccination status rather than records review, similar to other studies.[14,23,24] The <10% overall vaccine acceptance in our sample raised potential concerns about hesitancy. In other studies, there was a high OCV acceptance rate, with communities in western Kenya and Zanzibar reporting an acceptance rate of >93%.[25] Similarly, in the southeastern Democratic Republic of Congo, there was high interest in a no-cost OCV in areas with limited access to public health facilities.[25] Our findings, which show low acceptance of OCV, are supported by Munjita's findings[18] that significant hesitancy against vaccines is shaped by concerns about vaccine safety and efficacy, misinformation, mistrust and poor communication from health authorities, as well as reliance on sociocultural and religious beliefs and natural immunity. To counteract this, better knowledge of vaccine-preventable diseases, confidence in vaccines (including their efficacy and safety) and community trust in vaccination programs showed a positive association with vaccine acceptance and uptake.[26]

While our study did not find an association between sociodemographic variables and vaccine uptake, factors such as knowledge, attitudes and specific perceptions were significantly associated with OCV uptake among the vaccinated. Local sociocultural and religious beliefs significantly influence vaccine hesitancy in Africa, shaping perceived mistrust in medical interventions.[18] As seen in Nigeria's 2003–2004 polio vaccine boycott and hesitancy during the coronavirus disease 2019 (COVID-19) vaccination campaign, religious misinformation led to fears of sterilisation, thereby delaying immunisation efforts.[27] Additionally, local beliefs in traditional healing practices, such as those reported in Zambia[18] and the Democratic Republic of Congo during Ebola outbreaks, also sometimes compete with modern medicine, fostering scepticism and mistrust in medical interventions such as vaccination, driving up vaccine hesitancy.[28] Often, historical mistrust of 'western' medicines in Africa, as seen in our findings of growing perceptions that few vaccines used in Africa were effective, aligns with evidence in South Africa's COVID-19 vaccine hesitancy,[29] which was arguably rooted in similar mindsets. Misinformation fuelling concerns about fertility, such as those surrounding Kenya's human papillomavirus vaccine,[30] contributes further to vaccine hesitancy and a lack of confidence in vaccination programs across Africa. In South Sudan, reasons for hesitancy and refusal of OCV included fear of side effects and distrust in national institutions.[31] These issues cut across African countries and need to be addressed.

Despite the low self-reported OCV uptake and acceptance we found, arguably further attributed to perceptions about vaccine safety, access and availability, a generally positive attitude was observed towards OCV. Interestingly, the majority demonstrated an understanding that the vaccine was valuable for cholera prevention when used in conjunction with other public health measures. Similar to the Zambia national cholera situation report of January 2024 showing that more males than females were affected and died of cholera and relatively higher vaccination rates were among women than men between October 2023 and January 2024,[8] we also found gender differences in vaccine confidence. Among the majority (>80%) who expressed confidence in OCV and supported cholera vaccination programs, more than half (57.6%) were women (Table 2). This is an important finding, especially given that more women than men reported being vaccinated against cholera. Studies show that women generally have more confidence in vaccines than men, and often accept vaccinations for themselves and their children.[11,32] In this setting, enhancing confidence in vaccines, especially among women, may be key to improving OCV uptake, as they generally recommend vaccination to others in their households and community. There would be problematic social outcomes if there were lower cholera vaccination intentions and rates among women. This is because women generally have a central social role in ensuring the healthcare of their children and family members. Women are usually the first caregivers in their households, thus the potential for exposure to contracting cholera is high in this population. Additionally, in the community, women are more likely to participate in community health volunteering and social work, which also puts them at risk of contracting and transmitting cholera. Consequently, we see a need to improve knowledge and attitudes in this group.

In Africa, improving knowledge and attitudes toward OCVs requires targeted health education, community engagement

and trust-building initiatives with messages targeting specific marginalized groups such as women, youth and children. Studies show that integrating vaccine awareness into existing health programs and using trusted community figures, such as religious and cultural leaders, including local health workers, can enhance vaccine acceptance.[13] Culturally tailored and transparent communication addressing misconceptions, such as some perceptions seen in this study, shows promise in addressing hesitancy among diverse populations.[18] Recent evidence from a cluster randomized trial in Bangladesh suggested that improved household WASH practices and receiving the OCV interacted to provide greater protection against cholera.[33] In Africa, enhancing knowledge and attitudes toward OCV is crucial to disease prevention and requires a multifaceted approach that includes community education and engagement to foster trust in cholera vaccination.

Actionable activities for key stakeholders

Given the urgency of addressing the concerns found in this study, driven largely by hesitancy in the wake of the perennial cholera outbreaks in Zambia, Table 4 suggests actionable activities that key local stakeholders can consider to address issues and concerns affecting OCV uptake and acceptance in populations at risk of cholera in Zambia.

As mentioned, addressing vaccine hesitancy in general, not just in Zambia but across Africa, requires concerted, multisectoral, coordinated efforts, including collaboration with community leaders (religious, cultural and civic leaders), transparent communication and culturally and population-sensitive public health strategies.[13] Importantly, vaccine acceptance depends on public trust and confidence in the safety and efficacy of OCV, the health system, including healthcare professionals and information, and awareness about the vaccine. As observed during the COVID-19 pandemic in South Africa, accessibility of vaccination sites, user-friendly vaccination services and processes, public trust in the health system, including the candidate vaccines, and fear of dying from the disease were among the motivators for vaccine uptake.[34] Similarly, leveraging these combined factors into strategies can enhance OCV uptake, ultimately eradicating cholera in Zambia and across Africa.

Implications for vaccination programs and policies

Our research presents vital policy implications intended to guide decision-making and intervention strategies both in Zambia and elsewhere. To start, integrating OCV into routine immunisation programs and ensuring vaccine availability in healthcare settings is essential for improving access and uptake in cholera-prone areas. Furthermore, utilising local and culturally relevant methods to enhance community education and awareness, including incorporating cholera vaccination messages into formal education systems, can improve knowledge and counter misinformation about the vaccine. Finally, adopting gender-sensitive strategies that encourage women to act as vaccination advocates can significantly boost uptake within households and communities. Moreover, health policies aimed at ensuring equitable access to cholera prevention measures, like WASH and quality health services, should intentionally target underserved and high-risk populations, especially in informal settlements such as Kanyama. Implementing these measures may be critical to addressing the challenges of low OCV uptake in Zambia and other African nations.

Limitations of the study

This study was not without limitations. It relied on the participants' self-reported vaccination status, and there was no means of verifying the status. Additionally, qualitative reasons explaining the OCV uptake and acceptance reported were not studied. Thus the data were interpreted with caution. This notwithstanding, self-reported vaccination status has been used in similar studies elsewhere and is a cost-effective and easily accessible method for assessing vaccine coverage, especially in resource-limited settings. It allows large-scale data collection without requiring an extensive review of records. Our study did not employ the '5C' scale for measuring vaccine hesitancy. Therefore, apart from confidence, other aspects such as convenience, complacency, calculation (risks) and collective responsibility were not determined. Future studies can consider including these aspects.

Conclusions

Self-reported OCV uptake and acceptance were low. Despite this, the majority expressed confidence in the vaccination program. Knowledge, attitudes and perceptions were associated with OCV uptake. There is an urgent need to improve community knowledge about OCV, thereby addressing the misinformation that fosters vaccine hesitancy. We will be following up on the identified actionable recommendations with stakeholder groups in the future.

Supplementary data

Supplementary data are available at *International Health* online.

Authors' contributions: EM and ACK conceived the study and designed the study protocol. EM carried out the data collection. MMukosha carried out the analysis and interpretation of data. ACK, JM, MMulavu, SM, CM and BG drafted the manuscript. JCM and BG critically reviewed the manuscript for intellectual content, coherence and relevance. AH managed the project, approvals and resource mobilization. All authors read and approved the final manuscript.

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Data availability: The data presented in this study, including the tools employed, are available upon reasonable request.

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