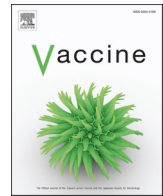


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## Vaccine

journal homepage: [www.elsevier.com/locate/vaccine](https://www.elsevier.com/locate/vaccine)

## Perceptions, attitudes, and willingness of healthcare and frontline workers to participate in an Ebola vaccine trial in Uganda

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## ARTICLE INFO

## Keywords:

Ebola  
Vaccine  
Perception  
Acceptability  
Willingness  
Healthcare  
Frontline  
Workers  
Outbreak

## ABSTRACT

**Background:** Understanding the knowledge, perception and attitudes towards Ebola vaccines is an important factor in ensuring future use of these vaccines. A qualitative methods study embedded in an Ebola vaccine immunogenicity and safety trial (NCT04028349) was conducted to explore the knowledge and perceptions of healthcare (HCWs) and frontline workers (FLWs), about Ebola vaccines and their willingness to participate or recommend participation in Uganda.

**Method:** We carried out focus group discussions and semi-structured interviews before and after vaccination, with 70 HCWs and FLWs who consented to participate in the trial, and in the qualitative component, from August to September 2019. Data were analysed using thematic content analysis.

**Results:** Respondents showed good knowledge about Ebola and the vaccines in general, and had wide access to information through several channels, including the study team. On prevention, particular attention was given to effective communication within health facilities. Misconceptions were mainly around route of transmission, animal origin and types of vaccines. Previous fears were based on rumours circulating in the community, mainly about the presence of the virus in the vaccine, side effects and intention to harm (e.g. by “the whites”), ultimately insisting on transparency, trust and involvement of local leaders. Acceptability of participation was motivated by the need to protect self and others, and the willingness to advance research. Majority were willing to recommend participation to their community.

**Conclusions:** Overall, information sharing leads to a better understanding and acceptance of vaccine trials and a positive vaccination experience can be a deciding factor in the acceptance of others. Particular attention should be paid to involving the community in addressing misconceptions and fears, while ensuring that participants have access to vaccination sites in terms of transport, and that they are properly accommodated at the study site including staying for a reasonable period of time.

### 1. Introduction

The Ebola virus was identified in 1976 near the Ebola River in what is now the Democratic Republic of Congo (DRC). Since then, an additional 26 epidemics of Ebola Virus Disease (EVD) occurred in several African countries. The West Africa epidemic of 2014–2015 was the most deadly

one, affecting close to 28 600 persons and causing an estimated 11 310 deaths [1]. Since 2000, Uganda has documented 5 outbreaks and 2 isolated episodes, which have caused a total of 578 recorded cases and 274 deaths [1–5]. The most fatal outbreak was the first and occurred in 2000–2001. It started in Gulu and later spread to Masindi and Mbarara districts, affecting 425 persons and causing 224 deaths [2].

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<https://doi.org/10.1016/j.vaccine.2024.03.053>

Received 19 February 2023; Received in revised form 16 May 2023; Accepted 20 March 2024

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Front line workers (FLWs) are in frequent interaction with communities and play an instrumental role in the identification and care for patients with infectious diseases. Health Care Workers (HCWs) may exert a positive influence on the prevention and control of these diseases through education and health promotion activities [6–8]. However, because of their role in providing front-line care, HCW are exposed to the infectious diseases they treat. During the 2014–2015 Ebola outbreak in West Africa, although the majority of transmission events were between family members (74 %), HCWs accounted for 3.9 % of all confirmed and probable cases of EVD in Sierra Leone, Liberia and Guinea, representing a 30-fold higher probability of being infected compared to the general population [9,10]. During the 1995 outbreak in Kikwit, they accounted for 25 % of all infections [11]. HCWs responding to filovirus outbreaks frequently encounter isolation and stigma from their communities, sometimes accompanied by mistrust. They suffer emotional trauma, depressive symptoms, and fear from witnessing colleagues suffer violent deaths [12]. In 2018, a study showed very poor or absence of understanding of zoonotic diseases, specifically EVD, by HCWs in Uganda [13].

Direct contact with the bodies of people who have died from EVD is one of the most likely methods of transmission. Changes in behaviours related to mourning and burial, along with the adoption of safe burial practices, were critical in controlling epidemics [14]. Prevention took on a new dimension when, towards the end of the 2014–2015 West-African epidemic, the first clinical trials on experimental Ebola vaccines was launched [15–22]. These studies paved the way for many subsequent trials that confirmed the promise of Ebola vaccines as long-term strategies for preventing epidemics [23–33]. Among them, only one involved Uganda [34].

The introduction of vaccines does not guarantee their immediate adoption; it is conditioned by a better understanding of the phenomenon of vaccine hesitancy, defined as “delay in acceptance or refusal of vaccines despite the availability of vaccination services” [35], and the implementation of solutions to address it. Understanding the perception and attitudes towards the vaccine is an important factor in ensuring the use of this and other vaccines against Ebola in the future.

In mid-2018, EVD preparedness gained considerable momentum when the Uganda Ministry of Health (MoH) launched the Public Health Emergency Operations Centre (PHEOC) and the National Task Force (NTF) for public health emergencies [36]. In August 2018, the DRC declared an EVD outbreak in North Kivu. By June 2019, the outbreak had spread to 26 health zones in north-eastern DRC, with more than 2000 reported cases and 1000 deaths. On June 10, 2019, members of a Congolese family travelled to western Uganda’s Kasese District to seek medical care and were subsequently diagnosed with EVD. The Ugandan Ministry of Health declared an outbreak of EVD in Uganda’s Kasese District, notified the World Health Organization, and initiated a rapid response to contain the outbreak [36].

In mid-2019, the ZEBOVAC trial started in Mbarara district. It was an interventional, single arm, open-label, non-randomized, phase II study aiming at accumulating additional data on immunogenicity and safety of the two dose regimen of Ad26.ZEBOV/MVA-BN®-Filo against Ebola virus disease [37]. Zabdeno (Ad26.ZEBOV) is a monovalent vaccine designed to provide active specific, acquired immunity to the Ebola virus. The vaccine is based on an adenovirus type 26 (Ad26) vector expressing the Ebola virus Mayinga variant’s glycoprotein. Mvabea (MVA-BN-Filo) is a multivalent vaccine preparation designed to provide active acquired immunity to the Sudan virus, Ebola virus, Marburg virus and the Tai Forest Virus [38].

In this paper, we present and discuss the results of the qualitative methods component of the ZEBOVAC trial, which aimed at exploring the perceptions of HCWs and FLWs (Table 1) about EVD and Ebola vaccines, and to best identify factors that promote or limit participation of HCWs and FLWs and the community in Ebola vaccine trials.

**Table 1**

Description of study participants (n = 70).

	Number (%)
<b>Profession</b>	
Nurse	17 (24.3 %)
Midwife	12 (17.1 %)
VHT	8 (11.4 %)
Clinical Officer	8 (11.4 %)
Laboratory technician	5 (7.1 %)
Cleaner	4 (5.7 %)
Nursing assistant	3 (4.3 %)
Counsellor	2 (2.9 %)
Medical Officer	2 (2.9 %)
Peer educator	2 (2.9 %)
Nursing officer	1 (1.4 %)
Theatre attendant	1 (1.4 %)
Laboratory clerk	1 (1.4 %)
Laboratory scientist	1 (1.4 %)
Driver	1 (1.4 %)
Physician	1 (1.4 %)
Security	1 (1.4 %)
<b>Sex</b>	
Female	34 (49 %)
Male	36 (51 %)

## 2. Methods

### 2.1. Study participants and setting

The study took place in Mbarara, in southwestern Uganda, about 270 km from Kampala, the capital. Information about the vaccines and the trial was given before conducting interviews and only HCWs and FLWs that were enrolled in the trial were interviewed. During the consent process, a total of 70 participants (Table 1) were voluntarily consented to the qualitative component of the study. Interviews were conducted among 20 HCWs and FLWs prior to their first vaccination (referred to as “prior”), and 20 were interviewed after the second vaccination (referred to as “post”), and 10 were interviewed twice - prior and after vaccination (referred to as “prior/post”). The two focus group discussions (FGD) involved 10 participants each. One was conducted before and the second one was conducted after vaccination (referred to as “FGD prior 1st vaccination” and “FGD post vaccination”, respectively). The participants were purposively selected to include different HCWs and FLW roles and gender.

### 2.2. Study design

The qualitative methods study was embedded in a clinical trial assessing immunogenicity and safety of an Ebola vaccine (NCT04028349). Data for the qualitative component of the trial were collected between August and September 2019. Healthcare (HCWs) workers included medical doctors, nurses, laboratory staff, medical or nursing students and village health team members attached to different health units/centres while Frontline Workers (FLWs) included support staff like cleaners, drivers, and security workers in healthcare settings.

### 2.3. Data collection methods

FGD and individual semi-structured interviews were conducted in English by trained and experienced social scientists. When meeting difficulties to express certain thoughts, participants could use vernacular that was immediately translated by the interviewer when necessary. Overall, there were very few utilisations of vernacular. Topic guides for the interview and FGD were used and focused on 1- Knowledge about Ebola, its transmission, prevention, treatment, and the source of the information, 2- Beliefs, perception, and knowledge of Ebola vaccines, and 3- FLWs opinions on factors influencing community participation in clinical trials and willingness of HCWs and FLWs to encourage such a

participation. The interviews were organised around the availability of the HCWs and FLWs and lasted between 40 and 60 min.

#### 2.4. Data management and analysis

Each interview was recorded, and data were transferred to a password protected computer. The recordings were later transcribed by a social science research assistant. Transcripts were coded by 3 coders using Nvivo software after going through several transcripts and agreeing upon the codes. The emphasis was on 4 concepts: knowledge, beliefs, attitudes, and perception. Concepts were sub-divided into additional categories such as transmission, prevention, treatment, and source of information for Ebola knowledge, and beliefs, perception and knowledge of vaccination and Ebola vaccines, and perceptions about the general community participation in future vaccine trials. NVivo software (release 1.6.1–1137) was used to code and allocate references to each concept and sub-category through thematic content analysis [39,40]. Content was further analysed by two researchers to explore the range of responses and capture the main findings via a deductive approach, and to identify emerging themes and patterns via a more inductive approach [41,42]. The most frequently expressed perceptions are reported, as well as examples of isolated and unique opinions [43].

#### 2.5. Ethical consideration

The qualitative methods study was included in the protocol for the vaccine trial approved by the Ugandan Virus Research Institute Research Ethics Committee (UVRI-REC), The London School of Hygiene and Tropical Medicine Research Ethics Committee (LSHTM REC), Uganda National Council for Science and Technology (UNCST) and the National Drug Authority (NDA). All data are confidential and were anonymised during transcription. Inclusion in the study was voluntary. All participants were asked to give written consent to take part in the study after receiving study information that described the aims, objectives, and procedures of the study.

### 3. Results

We begin this section by sharing a brief description of the interviewees in terms of role in the health sector. We then share the other findings following the themes in the study which include: knowledge of Ebola infection, knowledge and perceptions of Ebola vaccines, and willingness to participate in future Ebola vaccine clinical trials.

Seventy HCWs and FLWs from different services and professions were interviewed (Table 1). In this paper we only present their professions, other demographic data can be accessed from the main trial report.

We now present the findings according to the themes listed above.

#### 3.1. Ebola knowledge

##### 3.1.1. Transmission

Most HCWs and FLWs recognized that the EVD is “highly infectious” and that “it spreads very fast and is easily contracted”. However, there were different levels of understanding around Ebola transmission. While a nursing assistant stated: “I don’t know what causes Ebola but I know it kills people very fast”, others understood that “Ebola is caused by a virus which you can contract when you: get in touch with someone suffering from Ebola; if you are a care taker for an Ebola patient; if you come into contact with a remains of person who died from Ebola disease; or sharing items used by an Ebola person”. Exchanging clothing and razorblades were frequently mentioned as ways of transmitting Ebola virus.

Six HCWs and FLWs mentioned that people eating monkeys in Congo was a source of transmission and seven participants mentioned bats. The other modes of transmission mentioned include blood transfusion,

sexual intercourse, breastfeeding, waterborne, and through butterflies, birds, and rodents. Some mentioned that transmission was airborne while a laboratory scientist explained that “it is not air borne disease that we can breathe it” and a midwife said that she was “sure Ebola is not an air borne disease”.

Most of the participants referred to bleeding as one main symptom. However, a medical doctor when interviewed for the second time after vaccination, acknowledged that “what most people know is the bleeding yet it doesn’t actually happen in everyone”.

Two cleaners reported uncertainty about safety when close to patients: “with many patients [coming to the hospital], sometimes you don’t know whether this patient has Ebola or not or sometimes they [health care workers] may know, and you are not informed and you touch the patient, and you catch Ebola”.

##### 3.1.2. Prevention

Many HCWs and FLWs mentioned that direct contact or sharing objects must be avoided, hygiene measures must be respected (hand washing, objects decontamination), suspected individuals must be isolated and, when handling the sick, personal protective equipment should be used. Avoidance of traditional burying practices and bush meat eating were also mentioned by a few respondents. Interestingly, although many HCWs and FLWs reported vaccination as a method of prevention, and even as the “best way” during the semi-structured interviews, no one mentioned it in the two FGDs pre and post vaccination.

Some HCWs and FLWs mentioned community sensitization by VHTs (Village Health Teams) as an important prevention method. Media such as radio and television and involvement of influential religious and political leaders were seen as avenues to prevent Ebola.

##### 3.1.3. Treatment

Most of the interviewees agreed that treatment is “mostly supportive because there’s no specific cure” (Post, male). They mentioned emergency treatment to stop bleeding, give analgesics for fevers and headache, and give antiemetic’s if patient is vomiting. There was also a mention of blood transfusion for patients who need it.

Interestingly, a medical officer said during the second interview “People with Ebola are given simple treatment to offer hope that the person is going to get better but to my own understanding I haven’t heard of a patient who tested positive for Ebola and survived”. However, others did not hold the same view, for example, a VHT said: “I think Ebola can be treated if it is in early stages and I think there is medicine to cure it”.

Nine HCWs and FLWs explained the lack of treatment because of the viral nature of Ebola disease such as: “Ebola being a viral infection it has no treatment” (Prior, female). Some HCWs and FLWs compared Ebola to HIV which has no cure.

HCWs and FLWs may see vaccination as a treatment “for people who have had contact at least they can be immediately vaccinated before they convert and it has been shown to be effective for some people at least a big percentage” (prior/post 2nd interview, male). Similarly, a VHT said that vaccine can “help people who have gotten Ebola and those who have got into contact with the sick”.

The suggestion given for treatment by most of the respondents was referral: “refer them immediately to the designated health centres that they have purposely put to cater for people with Ebola” (prior/post 2nd interview, male).

##### 3.1.4. The source of information

Most HCWs and FLWs mentioned radios and television. Other sources included the Ministry of Health through training, billboards, notice boards at the health facility, newspapers and internet through social media including Facebook and WhatsApp. Others mentioned that they have read literature online and books and some mentioned “health talks” by “religious leaders [who] emphasized prevention” (FGD post vaccination).

### 3.2. Knowledge and perception about Ebola vaccines

Most of the HCWs and FLWs had a positive opinion about the Ebola vaccine. One of the many explanations includes their own experience with vaccines, which can be illustrated by the words of a female cleaner: “we have heard of polio, hepatitis B, measles, all those are vaccines so when I hear the vaccine for Ebola I think it [is] also a nice vaccine”. Some HCWs and FLWs mentioned that they found it reassuring that they were not the first ones getting the vaccines: “this is not the first one in the program, I am not number one, it has been used elsewhere, not only in Uganda but worldwide, in international programs” (Prior/post 1st interview, male).

The findings show that most participants knew that they were participating in research that is testing a vaccine: “it is not ready it’s still under research” (Prior, Male) and a nurse said: “I know that these vaccines are not yet approved they are still under study and there are high risks” (Prior, male).

Another reason for participation was given by a member of the support staff: “if you compare in Congo people are dying in thousands so that’s why I am surrendering myself to be a research tool until they establish the real vaccine and save the people”. Similarly, a midwife felt “privileged to participate in finding a solution to preventing the Ebola disease”.

Some participants realised they had gained more information about Ebola when they decided to take part in the trial and gained confidence. Before this first vaccination a clinical officer mentioned: “I was worried before I came here, I said [...] they are going to inject me with a virus but the doctor here said they just got some glycoprotein [and] I got a bit calm”. When being interviewed for the second time, after vaccination, he said: “Right now I think that the vaccine is very safe [and] since I got the vaccination I have been ok no side effect” and acknowledged: “my participation has given me so much information and therefore changed my attitude towards the vaccine”.

#### 3.2.1. Rumours

A cleaner said that “vaccines are made out of live virus that’s the most important part that brings doubts to people” (Prior, male), while a physician said: “it is a live vaccine directly extracted from Ebola virus that was my biggest concern and worry and probably what was going to make me not to come” (Prior/post 1st interview, female). A VHT even said that “some VHTs are saying that they want to inject us with Ebola to be killed” (Post, male). Similarly, a midwife confirmed that “some other people including health workers still think that if injected with that thing we may get Ebola!” (Post, female).

As for vaccines in general, similarities between the Ebola vaccine and the virus induced confusion and fear. One physician confirmed: “I think it’s just because most people do not know exactly how this Ebola vaccine is made so they are not sure of what it can do and what it may not do”.

There are also rumours of intentional damage for nefarious reasons. Among others, a cleaner said: “you can’t fail to have some doubts about vaccines because many people fear the whites”. A nurse said he has heard people saying that in “area like in Congo since there’s a lot of gold and timber, they want those people to die” and a medical officer heard that “they are actually here to make money [...] and if the study is successful these vaccines will be on market and manufacturers will get money”.

### 3.3. Willingness to participate in future Ebola clinical trials

#### 3.3.1. HCW’s and FLW’s beliefs and attitudes towards participation

Some HCWs and FLWs expressed a desire to protect others. After her second vaccination, a nurse said: “I am a health worker and I am saving life and as I participate in research I know am saving other lives” (Post interview). Others did participate to get protection for themselves. A midwife said: “my major aim for coming for this vaccine is majorly to protect myself against the disease” and another referred to the trial as an

“opportunity to be immunized [as] I may not get another opportunity in near future to be immunized against Ebola” (Prior/post 2nd interview) and a VHT said: “since Ebola is a killer disease I came here because I don’t want to die”.

Interestingly, beyond protecting themselves and others, some mentioned that they felt particularly keen in participating in research. A midwife said: “I have a belief that all what we see around was once tested from people like any medicine they first test it and send it on the market we use it. The other people agreed to be tested for [different drugs] for the generations to come, then why not me?”, and a laboratory technician recognized that “if we don’t participate as humans there wouldn’t be interventions” (Prior).

The other factors that positively influenced HCWs and FLWs participation into the vaccine trial included life experiences such as the meals that were given during the clinic visits, the transport refund and the insurance that was offered to them during 2 years after inclusion.

#### Willingness to encourage community participation

The most common reason was that they had not experienced any side effects. A nurse explained: “I am taking myself as example that as you think that the vaccine contains Ebola now for 6 months or one year I am here alive and have never suffered from the disease that one can help someone to join”. In the same line, a VHT said: “I would be willing to tell people to be vaccinated against Ebola after I and other colleagues have not developed serious side effects after being vaccinated because it’s when I will know that the vaccine has worked” (FGD prior, female).

Some HCWs and FLWs said they rather preferred to inform rather than encourage. For example, a nurse explained before his first vaccination: “I would not encourage, I would explain to them what the study is about then if they can also make their own decisions then they can participate” and he reiterated after vaccination “I can’t now encourage them to participate since it’s still a trial let’s first wait for the results if it is approved then I encourage them to participate”. Similarly, before first vaccination, a VHT said: “when it is confirmed that it works [...] I will be the best preacher of the immunization gospel”.

#### 3.3.2. How to motivate community members

Most of the participants noted that sharing of information from previous experiences was the best way to motivate community participation. A clinical officer clearly stated that “you should emphasize on the previous data”. A suggestion to explain in more detail about the possible side effects was cited as one way to encourage community participation.

Another suggestion from the respondents was the need to reassure the people that the vaccine did not contain Ebola and that there was no malicious intent on the part of some stakeholders. A clinical officer said that the community might think that “these white people want to give them diseases and may be kill them so [...] their anxiety has to be lowered”. A physician also drew attention to the fact that “with culture and things like Muslims they also want to be sure that these are not extracts from pigs or things they are not comfortable with”.

More broadly, most interviewees also insisted that it was important to share information about the disease, besides the vaccine. A nurse explained: “you need to mobilize people, sensitize, through health education so that people may know the badness of that disease, the cause, transmission and prevention”. The need to mobilize people through churches, radios and TVs, “through community leaders like the LCs (local council leaders) VHTs (Village Health Teams)” (Prior, male) and “even some of us who have been vaccinated” (Post, female) were also mentioned. A physician pointed out that it is important, when involving local leaders, to help them understand what you want to do and how this would benefit their communities.

Some HCWs and FLWs insisted on transparency. A physician said: “holding [back] some information because it sounds a bit scientific for the general population doesn’t help [...] it is important that you tell them what exactly Ebola vaccine is. Because by the time I was confused [...] I didn’t know whether it was alive or what”. Similarly, a nurse said

“they were kind of worried, many of them thought it was a weak or killed Ebola virus [...] but according to the information I had gotten at first on DNA (re)combinants of Ebola, when I told them they were able to understand what the trial is all about.”

A few participants underlined the importance of having trial information come from “trusted sources and approved sources” (Prior/post 1st interview, male) because, according to a laboratory technician, “if I get information from somewhere I don’t trust I will not take it”. A VHT mentioned the importance of involving their “leaders [and] health workers because people get to trust when they see their leaders first”. A peer educator suggested: “you can go with that person who was vaccinated and that one will give a testimony can even show his card you know for us Africans we are hard to be convinced”. The interviewees who had been vaccinated, would share the correct information. A midwife insisted on the need for the trial staff to be “friendly because people fear you will go to hospital and people will start harassing you [...] and they will be stigmatised”.

The time spent at the clinic was of concern for the participants. A laboratory technician said that “the process takes so long [...], people have other activities. If it takes so much time, it will discourage other people to come”. Other interviewees suggested that the trial staff “should actually give people real appointment time” (prior/post, 2nd interview, female). Other incentives include providing transport to volunteers, T-shirts, calendars for hanging in their houses and even organizing envelopes with prizes. A cleaner reminded that “people in the villages most of them are poor so if you can provide some transport” and, similarly, a midwife suggested that “the vaccination centre becomes nearer to someone’s place of residence”.

In terms of willingness to participate in Ebola vaccine trials, HCWs and FLWs insisted on sharing trusted information and previous data about the vaccines under trial. Transportation reimbursement and other incentives also positively influenced participation. Among these, access to medical care during the study period has been shown to be an important motivation in other settings [44–47].

#### 4. Discussion

In this study we sought to explore healthcare and frontline workers’ knowledge and perceptions of Ebola vaccines and their willingness to participate or recommend participation in such a trial to their community. The acceptability of Ebola vaccines appears to be high among HCWs and FLWs in the Ugandan study setting. This is consistent with previous studies that were performed in Guinea and DRC and showed acceptability of Ebola vaccines to be 86 and 82 %, respectively [48,49]. Similarly, a study conducted in Nigeria demonstrated that participants could be willing to pay for an Ebola vaccine [50]. However, despite overall good acceptance, other studies have indicated that vaccine acceptability is not consistent across all populations. A study conducted in Guinea showed that although 38 % of the population fully accepted vaccines, 25 % did not, and the others were more hesitant [51]. Other research revealed that mistrust of a Guinean surveillance team generated unwillingness to participate in a vaccine trials for 34 % of the interviewees [21]. Our findings are consistent with other studies that have identified different perceptions regarding experimental Ebola vaccines, ultimately influencing the evaluation of risk and benefits by participants, hence determining whether to participate in an Ebola vaccine trial [52,53].

We found that participants were able to express the uncertainties and reluctance they had before clear information was shared by the study team, together with those of the community, confirming the existence of some level of vaccine hesitancy among HCWs, FLWs and the community in our setting. Importantly, the pre- and post-study interviews did not show any significant change in respondents’ knowledge and perspectives on vaccination, and respondents generally had factual information about Ebola transmission and prevention. This may be largely explained by the fact that substantial information was given prior to study

inclusion through various channels, including significant briefings by the trial team. However, some respondents were somewhat reassured about adverse events after the first vaccination.

Most of the information was received from television, radio, social media, and personal interactions, through which the participants were able to build up some knowledge about EVD. However, despite these and the knowledge transfer from study team, few misconceptions remained. Specifically, concerns about side effects were expressed and gaps in knowledge about vaccine technology were identified. Indeed, as shown in the findings of other studies, these appear to be major areas of focus for improving willingness to accept vaccination [54–57]. In line with a research conducted in Sierra Leone [53], our study demonstrated the need to reassure participants that the vaccine is safe, that it does not contain Ebola, and to provide the most transparent and accurate information regarding the composition of the vaccine and the level of protection it is intended to confer. In addition, and similar to other studies, mistrust around organizations from the global north were also expressed [44,58–63] indicating that a relationship of trust must be established, with approved information that must be deemed reliable. To this end, involving community leaders appeared to be essential, while taking into account local understanding of health events and medical interventions [60,64–67].

Participation of HCWs and FLWs in the ZEBOVAC vaccine trial was mostly motivated by a desire to protect themselves, but also to protect others and, for a few of them, to contribute to scientific progress, in line with findings from a study in Guinea [44]. These disparate motivations also illustrate that the difference between medical research and medical care, as well as the objectives of the study, may remain unclear to some participants in health research projects [44–46,68–70].

Our findings show the importance of sharing correct and reliable information about the experimental vaccine and the disease for participants to adhere to a trial. However, other studies have shown that participants may not understand the risks and benefits of a clinical trial in the same way as the researcher [71–74]. Knowledge is often transmitted by media and may often be associated with historical, sociological and political baggage, ultimately shaping understanding and trust [60,75,76]. Providing correct and thorough information to research participants about Ebola vaccines while considering the socio-cultural context is not only an important consideration in international research ethics, but can also greatly enhance participation to experimental vaccine trials globally.

##### 4.1. Limitations

There are limitations to this study. First, we were not able to include HCWs and FLWs who had not received any information about the trial. All participants had to first provide consent and this may have influenced some of their responses since they had some recall of knowledge shared during the consent process. However, this would not influence attitudes and beliefs before vaccination, and the intention was not generalisability but insights into what HCWs and FLWs experience and perceive of the Ebola vaccines. Findings from the group that participated in the before and after vaccination shows that information may not change much however perception, especially regarding adverse effects, may change over time. Second, as this study was conducted in one location in Uganda, the results are not generalizable to all settings. However, given that the main themes resulting from this study are similar to others, we can be confident that lessons can be learned from this study and applied elsewhere. It would be important to ensure a qualitative study is conducted in future Ebola vaccine trials and eventual rollout.

#### 5. Conclusion

Our results showed different levels of knowledge and perceptions around the EVD held by HCWs and FLWs. Personal and community

welfare are at the heart of vaccine hesitancy and therefore clear and trusted study information needs to be shared more frequently with research volunteers and the community to avert rumours and misconceptions, given that people may recall it differently. Incentives such as a meal, transport and insurance may encourage someone to take part in research and this is an area for further exploration.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

Data will be made available on request.

### Acknowledgment

We would like to thank the participants who accepted to take part in the ZEBOVAC trial and the Coalition for Epidemic Preparedness Innovations (CEPI Grant No. CON-001559) for funding the study.

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