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Community members' knowledge, attitude, and practices towards Ebola virus prevention in the Western Province of Rwanda

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Abstract

Background The Ebola Virus Disease (EVD) for decades has been a public health concern in some parts of the world especially in East, Central, and West Africa. Despite investment in improving community members' health, there is regular resistance to available intervention, with little literature describing the reasons. This necessitated exploring knowledge, attitude, and practices of community members' towards the EVD prevention strategies in the Western Province of Rwanda.

Methods Authors present qualitative data from a mixed-method survey of the UMURINZI program conducted in Rubavu and Rusizi districts of Rwanda. Respondents' were purposefully chosen for the study and verbally consented to participate. Data was mainly collected between July and August 2020 in the Rwandan native language Kinyarwanda which was later transcribed and translated into English. All quantitative data analysis of respondents' socio-demographic characteristics were performed in STATA version 25. ATLAS Ti version 5.1 was used to summarize qualitative data (Focus Group Discussions (FDGs) and In-Depth Interviews (IDIs)), using a deductive approach. Ethical approval for the study was obtained from the Rwanda National Ethics Committee.

Results A total of 165 participated. Among those who took part in the FGDs, n=115 (69.70%) were male and had at least secondary education n=80 (48.48%). Among the 19 IDIs respondents, n= 11 (57.89%) came from Rusizi and were mostly n=13 (68.42%) men. Majority of them n=14 (73.68%) had a bachelor degree level of education. Our study found that participants were aware of EVD and the UMURINZI program due to community-based awareness activities. Despite knowing what EVD was, some were hesitant to be vaccinated for religious or personal beliefs and unfounded rumors. Through community engagement and mobilization efforts, community members started practicing desirable behaviors towards EVD prevention.

Conclusion Our study found that some respondents were aware of EVD and the UMURINZI program, and had started to adopt the positive attitudes and practices suggested by program supporters. We propose that similar initiatives; effective community engagement and mobilization be used to maximize desired behavior.

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Keywords Ebola virus disease, Ebola virus vaccine, Rwanda, Western province, Knowledge, Attitude, Practices, UMURINZI

Background

Ebola Virus Disease (EVD) is a deadly and fast-spreading disease. EVD epidemics have occurred in several countries, but the largest to date is the West Africa 2014-2016 outbreak, which was responsible for a few cases detected in Europe and the United States [1–3]. This outbreak recorded about 28,600 cases with more than 11,300 deaths (mortality rate of 39.5%). EVD outbreak in Liberia grew quickly and resulted in hundreds of deaths, with cases being transported into Nigeria [4, 5]. In Guinea Conakry, EVD demonstrated a transmission tree of 152 confirmed and probable cases –indicating an infection percentage of 82% within the community and 72% in families [4, 6]. Parallel to the West African EVD, there was also an outbreak in Boende town in the Democratic Republic of Congo (DRC) known for several deadly EVD outbreaks to date [7–9]. Before these outbreaks, control and preventive measures including international flight cancellations, curfews, hospitalization, monitoring contacts of infected patients, and hygiene practices, were the only known means to limit diseases such as EVD – Treatment options or sustainable measures were still missing [5]. EVD outbreaks have therefore presented an urgency for the development of several treatments and vaccine options such as TKM-130,803, convalescent plasma, and monoclonal antibody cocktail (ZMapp™, Mapp Biopharmaceutical, San Diego, CA, USA). According to Ana Maria Henao-Restrepo and collaborators on the test for efficacy and effectiveness of the rVSV-vectored vaccine, no one became EVD positive within the 84 days of their follow-up [10]. In the DRC, the rVSV-ZEBOV-GP vaccine was introduced in August 2018 and proved effective in the control of EVD outbreak [8]. Two EVD vaccines received regulatory approval and have been pre-qualified by the World Health Organization (WHO) —a single dose vaccine called Ervebo (rVSV-ZEBOV) approved by the European Medicines Agency as well as the United States Food and Drug Administration in December 2019 and others, then a two-dose vaccine regimen called Zabdeno (Ad26.ZEBOV) and Mvabea (MVA-BN-Filo) given 56 days apart, became approved by the European Medicines Agency in May 2020 [11].

Diseases such as EVD and their vaccines have been subject to infodemic causing misinterpretation by community members, affecting adherence to public health measures [6], and presented a dilemma as to whether to get vaccinated with a new vaccine or not [12]. Individuals have personal criteria to determine if they should accept or hesitate to vaccinate. The Canadian National Advisory Committee on Immunization (NACI) has categorized some of these criteria into four: perceptions of vaccines, perceptions of disease, the process of getting vaccinated, and individual and societal factors [13]. For instance, Miguel Pugliese-Garcia et al. [14] and L A V Marlow et al. [15] demonstrated that acceptability and perceived safety (religious and traditional practices), competing beliefs, and vaccine misinformation (western propaganda, satanic and preferred informal and traditional alternatives), previous experiences with vaccines (side-effects), misconceptions, perceived effectiveness, and insufficient knowledge on the vaccine, are some of the reasons why people may hesitate vaccines. Thus, thoughts around such vaccines need to be explored to enhance strategies for disease prevention. Actions such as population-level (mass vaccination campaigns while using community-acceptable languages and media campaigns) and primary care level efforts (individualized interventions targeting patients and/or healthcare providers, for instance, education, being a man, and having a positive attitude) are reported to enhance vaccine acceptability [13, 14, 16–20]. Despite the highlighted factors, most low-income countries still have weak health systems that affect such sound health strategies [21].

EVD outbreaks in East Africa have mainly been in the DRC and Uganda – Rwanda's neighboring countries. Rwanda has remained an EVD-free zone, but 10 districts are at risk of the disease because of their closeness to the DRC (Western Province) and Uganda (Eastern and Northern Provinces). This proximity has prompted the government to put in efforts to protect its citizens since 2018. Such efforts include screening at borders, the creation of a toll-free number to report suspected cases, isolation units in hospitals, EVD treatment centers, and EVD preventive vaccination [8, 9, 22–24]. Despite investment in health promotion [12], community members still resist [25–28] these interventions.

Different studies have been conducted to explore knowledge, attitude and practices (KAP) on Ebola in various communities in Africa. In Sierra Leonne, for example, Jalloh et al. [29] conducted a national survey and discovered that 60% of respondents knew the signs/symptoms of EVD including fever, diarrhea and vomiting. They reported a high level of discrimination against Ebola survivors. However, practices such as hand washing with soap (66%) and avoiding physical contact with suspected EVD patients (40%) were reported by the respondents as preventive measures. In another study conducted in Uganda by Musaazi et al. [30], it was found that 63% of respondents had knowledge on three key measures to prevent EVD including frequent hand washing with soap,

avoiding physical contact with suspected Ebola patients, and avoiding burials involving contact with a corpse. Comprehensive knowledge was found to be high in the high-risk districts compared to low risks (65% and 55% respectively). While 61.8% of respondents indicated that they would welcome survivor back into the community, only 4% engaged in all the three preventive measures [30]. On the other, Vinck et al. [31] found that in DRC, 31.9% of respondents trusted their local authorities to represent the needs of the population while 25.5% did not believed in the Ebola outbreak. These insights informed context-specific preparedness strategies helping to prevent and respond to outbreak [32, 33].

That notwithstanding, there is limited knowledge on how community members perceive EVD immunization programs and related strategies. This gap necessitated exploring knowledge, attitude, and practices of community members toward the EVD prevention program in the Western Province of Rwanda.

Methods

Study country context

Rwanda is a landlocked country lying South of the Equator in East-Central Africa. Rwanda is bordered by Uganda to the North, Burundi to the South, Tanzania to the East, and DRC to the West. The UMURINZI program was conducted in the districts of Rubavu and Rusizi, closely bordering DRC where several episodes of the EVD had been reported. These sites were chosen as they were highly exposed and the Government of Rwanda wanted to protect her citizens against the disease.

Design

We present qualitative findings from a mixed-method cross sectional study that explored community members' knowledge, attitude, and practices towards Ebola Virus prevention in the Western Province of Rwanda. Since the Ministry of Health - DRC announced on 14th July 2019 an EVD case around Western Rwanda [8], the Government of Rwanda implemented a preparedness and prevention program in Rubavu and Rusizi (including some walk-in participants from Kigali crossing to DRC) districts of Rwanda, establishing the UMURINZI program. The program was initiated in December 2019 to mobilize, engage, and vaccinate community members with the Ad26.ZEBOV vaccine as 1st dose and MVA-BN®-Filo® for the 2nd dose vaccine [23, 24]. Dedicated staff were in charge of promoting the UMURINZI program. They were mainly Community Health Workers (CHWs) and Rinda Ubuzima staff.

Respondents' recruitment and setting

Data related to the 165 respondents who participated in the survey were extracted. Unpublished records show that for practical reasons, a purposive sampling strategy was utilized to recruit study participants for the In-depth Interview (IDI) and Focus Group Discussion (FGD), which were also decided by the level of saturation from Rubavu and Rusizi districts. All responders were knowledgeable of the program and willing to participate. Additionally, for the IDIs, respondents ought to be involved in the program implementation. A total of 165 respondents: 8 FDGs in Rusizi and 12 in Rubavu (7–11 persons per group); 8 IDIs in Rusizi and 11 in Rubavu. For the IDIs, the participants included community health workers, heads of health facilities, local leaders, and health care providers. The FGDs included all community members from diverse works of life including fishermen, farmers, and border crossers.

Data collection and management

All quantitative data of participants' socio-demographic characteristics were performed in STATA version 25. We extracted our qualitative data from FGDs and IDIs that were conducted by trained social scientist from Rinda Ubuzima. A Community Advisory Group (CAG) made-up of different stakeholders from the private and public sector including the Ministry of Health was formed. Members of the CAG validated the interview guides designed by the social scientist at Rinda Ubuzima in English language (appendix 2). The guides were later translated to Kinyarwanda and back translated to English for accuracy. All data were collected in the Rwandan local language Kinyarwanda between July and August 2020. To ensure rigor in the data collected, multiple strategies were employed in data collection: interviews (with note taking and recording); participant observation; group discussions. Each day of data collection was also followed by debriefing meetings (appendix 3). IDIs could last between thirty minutes and one hour while FGDs between one hour and one hour thirty minutes. All the collected qualitative data were later recorded in Microsoft Word and saved in rich-text format, on password-protected computers as well as an external drive if soft and in a locked cupboard if hard copies, under the control of the data manager. All findings from the study were presented to study participants to ensure they reflected what they meant especially during the IDIs and FGDs.

Data analysis

All quantitative data analysis of respondents' socio-demographic characteristics was performed in STATA version 25. Data collected in Kinyarwanda from the FGDs and IDIs were translated into English. The data were then imported into a qualitative software program (ATLAS Ti version 5.1) and a deductive approach was used to identify knowledge, attitude and practices of community members. Using this method, we interpreted

Table 1 Socio-demographic description of respondents involved in FGDs

Variable	Value	Total/frequencies (*n*)	Percentages
District	Rubavu	75	45.45
	Rusizi	90	54.55
Gender	Female	50	30.30
	Male	115	69.70
Education level	Primary	47	28.48
	Secondary	80	48.48
	University	38	23.03
Occupation	Program manager/ Health care provider	23	13.94
	Business	87	52.73
	Student	39	23.64
	Local leader	16	9.70

Table 2 Socio-demographic description of respondents involved in IDIs

Variables	Value	Total/frequencies (*n*)	Percentages
District	Rubavu	8	42.11
	Rusizi	11	57.89
Gender	Female	6	31.58
	Male	13	68.42
Educational level	Secondary	4	21.05
	Bachelors	14	73.68
	Masters	1	5.26
Occupation	Program promoters / health care providers	10	52.63
	Business	6	31.58
	Immigration officer	1	5.26
	Pastor	1	5.26
	Policeman	1	5.26

and classified responses into categories with similar meaning.

Ethical considerations

Ethical approval for this study was obtained from the Rwanda National Ethics Committee (IRB 00001497 of IORG0001100). The study was conducted in accordance with the Declaration of Helsinki and all study respondents provided verbal consent to participate. All those who were involved in the program had been trained on best research practices. The research team actively collaborated at all phases to ensure that program respondents' rights were respected.

Results

During the implementation of the UMURINZI program, several data have been collected. In this section, we first present respondents' demographic information and then the knowledge, attitude, and practices of survey respondents from the conducted FGDs and IDIs.

Table 3 Study themes, sub-themes, and definitions

Themes	Sub-themes	Definitions
Knowledge	EVD symptoms and UMURINZI	This referred to being able to identify symptoms of EVD and ability of being able to explain the UMURINZI program.
	Methods of transmission	It was referred to as the methods for EVD transmission.
	Measures in Place	All measures put in place to tackle the disease within the community.
	Rumors	This included all held and unverifiable information community had about EVD and the program.
Attitude	Influencers of attitude	We defined this as aspects that made respondents to either think of considering program recommended actions or not
Practices	Enabling actions	These were actions taken to prevent EVD by community members and stakeholders

Socio-demographic characteristics of FGDs and IDIs participants

Of the 165 participants, n=115(96.70%) were men, and n=80(48.48%) had at least a secondary education. The majority, n=87(52.73%) were in business (Table 1). Most of the 19 IDIs respondents, n=11(57.89%) were from Rusizi, with n=13(68.42%) being men. The majority, n=14(73.68%), had a bachelor's degree. More than half n=10(52.63%) of the study respondents disclosed that they were program employed as promoters or health care professionals, followed by those who reported that they were in business for a livelihood n=6(31.58%) (Table 2).

Knowledge, attitude, and practices towards UMURINZI Program

The results were presented according to the three main themes as further captured on Table 3.

Knowledge

Knowledge of what EVD is, its prevention, and treatment was known by most respondents. Through FGDs/IDIs, respondents showed that they know what EVD is and how it is transmitted through body secretions. Some participants acknowledged knowing the existence of EVD vaccines, and other existing measures put in place to improve public health, and alert the community about the disease. Participants further mentioned that they knew reasons for the prevention against the disease through ongoing public health promoting activities. The messages state that vaccination against EVD is important, and that EVD could easily be transmitted if an outbreak were to happen in Rwanda. These participants also

correctly spelled out the symptoms of EVD that they had learned to include fever and diarrhea. Findings related to knowledge are summarized in Fig. 1 followed by some excerpts.

> *"A person who has this disease will present with symptoms, including; fever, diarrhea, and so forth. After some time, the person will start bleeding in all body orifices; at that time, he or she will reach the final stage of the disease; and if not treated urgently, he/she will soon die"***General community / Urban FGD, Rubavu.**
>
> *"We heard that Ebola originated from wild animals, and I think that the people who eat those wild animals are the ones who started spreading it to humans. Ebola is a deadly disease and as we have been taught, we have to be vaccinated against it"* **General community / Urban FGD, Rubavu.**
>
> *"Ebola disease also can be transmitted through getting in contact with the secretion from a person who has it. More so someone who has started showing symptoms of the disease. Another way of getting infected is touching the dead bodies of bats that died spontaneously. It can also be transmitted through touching dead bodies of any mammals that died due to Ebola disease. Hence the reason why they don't allow people to bury their relatives who died due to Ebola"***IDIs, Rusizi.**

Additionally, respondents expressed being aware of EVD through the ongoing activities within their communities from various promoters. For instance, a respondent said:

> *"They always sensitize us about Ebola disease; before COVID-19 came we could get regular education about Ebola disease. Our leaders would find us in our villages and educate us about it; even in all meetings they had with us, they would talk about the Ebola disease. The reason why I am sitting here unvaccinated, it's because of the problem I have. I was number one on the list, but due to my ill health, I failed to come for vaccination. Otherwise, they had educated us much about this disease"***Gihundgwe - Non vaccinated: General Community FGD–Bugarama, Rusizi.**

Participants also highlighted that they knew the vaccination site around the borders of the two prioritized districts and what they needed to do to get vaccinated as stated by a respondent:

> *"In January this year I went to Congo, and when I reached the border, I found tents arranged near the*

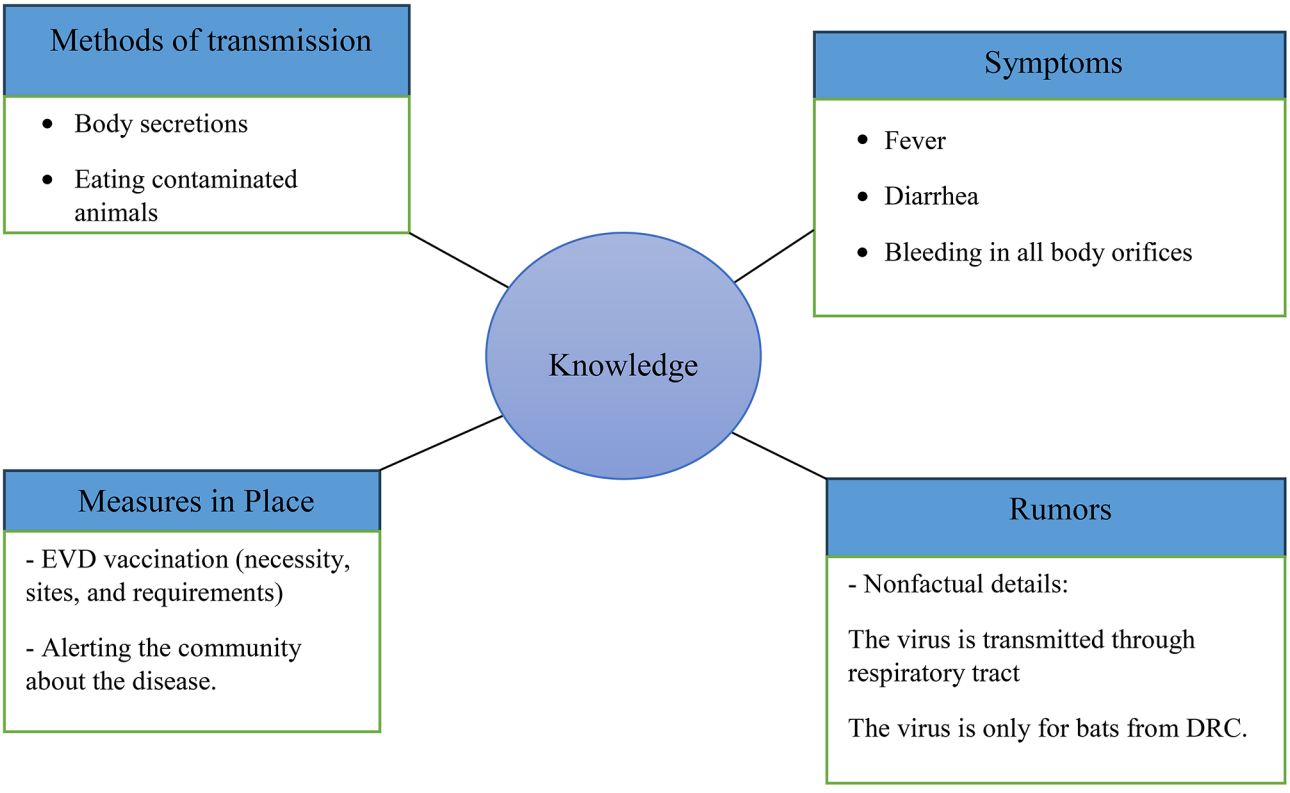

Fig. 1 Knowledge about EVD

*main border post, and there were many people there. When I asked, they told me that there are activities of vaccinating against Ebola disease. I proceeded and crossed to Congo, and when I came back, I went to where the vaccination exercise was being conducted, and they gave me an appointment card for vaccination.....”***General community / Urban FGD, Rubavu.**

Though majority of respondents had good knowledge about the program, some had mixed information with nonfactual details on the entire program, demonstrating a knowledge gap. For instance, some respondents believed that the virus came from DRC and it was only from bats or animals that originated from the DRC.

*“Generally, the virus that causes Ebola disease lives in bats; but not all bats. They live in the type of big bats that are commonly found in big forests mainly found in Congo; we rarely see such types of bats here in Rwanda. Then when these bats that harbor Ebola virus urinate on something, or eat something and leave their saliva on them; and then other mammals go and eat it; they get infected with this Ebola virus. In that case, when a person eats those mammals that have got the Ebola virus; he or she may end up getting infected with that virus. As you may know, many people like eating game meat, especially people from our neighboring country of Congo. There are even some people who eat bats; but not these bats we see here in our country, but those big bats that are found in Congo forests”***IDIs, Rubavu.**

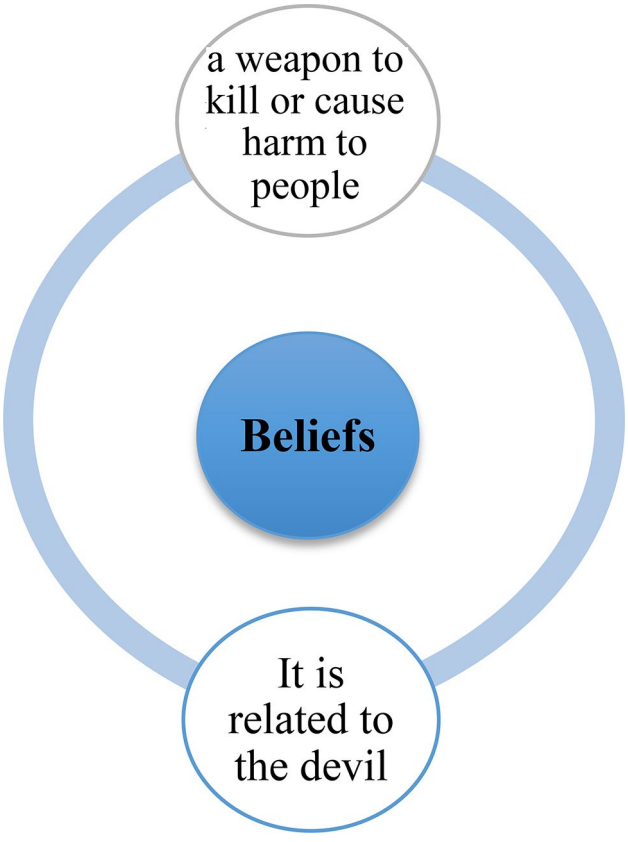

Fig. 2 Beliefs around EVD Vaccine

Attitude

Data showed that participants were not willing to initiate vaccine demand due to held and shared rumors about EVD and the vaccine. They couldn't imagine nursing the thought of uptaking these vaccines when the said disease was not in the country. This was worsened when vaccinated members shared unverified claims about the after effects of the vaccines. Furthermore, at the beginning of the program, community members did not understand the aims which might have affected their attitude but with the tailored education about Ebola disease and the program, some started demonstrating a positive attitude [Fig. 2.]**.**

Respondents from both vaccination sites stated:

“Some people were asking themselves, why are they taking photos of people's irises? Some were saying that; maybe they want to keep your record so that they may be controlling us wherever we are or what we do. That's the rumor they created about this method” **CHW rural; FGD from Rubavu.**

“They were saying that we were injected with Ebola and that we were chosen to spread it in Rwanda. But those were just rumors” **Rural FGD, Rubavu.**

“I have had rumors that when a man gets vaccinated, they become useless ....and they can even be chased away from their home. Another rumor is that white people have programmed this vaccine to develop itself into another disease in the long run. Also, I have heard people say that this vaccine makes people sterile..... ( )” **IDIs. Rusizi.**

“For instance, at the beginning of this program, people coming for vaccination were very few, but as the time went by, they kept increasing; but now we receive many people. Mainly because they have realized that this vaccination is safe. Initially they feared to come because they thought they may develop side effects. But as they saw, people who are vaccinated are not getting any problems; they have never seen anybody coming to seek medical help at the health centre due to this vaccination. Even the few who get minor side effects like mild fever or headache, they subside soon after taking simple analgesics such as paracetamol. This encouraged many people to come for this vaccination in big number” **IDIs, Rubavu.**

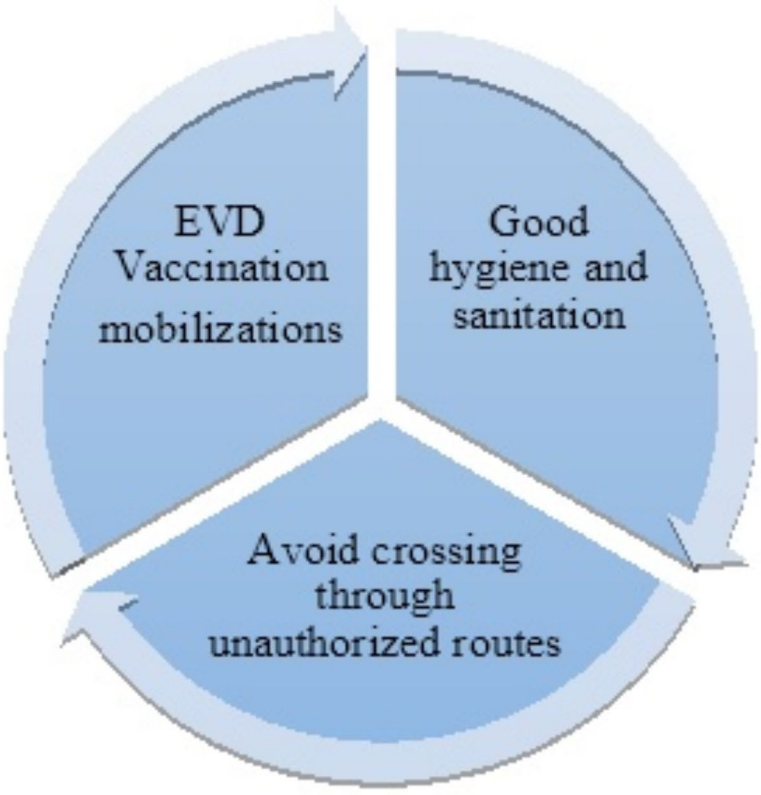

Fig. 3 Practices toward EVD

Practices

The IDIs and FGD activities conducted in the Western Province during the Ebola vaccination campaign revealed that after being providing community members with the necessary knowledge about EVD, placed at the center of program through community engagement and mobilization efforts as well as the involvement of community members and leaders, members started practicing desired behaviors towards EVD prevention. Some of these practices reported were social preventive measures such as hand washing with soap, reporting of unusual deaths, and respecting border crossing instructions and embracing vaccines despite the crowds at vaccination sites [Fig. 3.]**.**

> *"Something we people who live near the border do to prevent Ebola is that we try to avoid crossing through unauthorized routes going to Congo. Because only a few people were vaccinated against this disease; so, you may cross to Congo through lake Kivu and come back with Ebola, and then transmit it to other people here"* **Fully vaccinated Gihundwe FGD, Rusizi.**

Or they can simply adhere to the simplest EVD preventive measures as reported by a local health care professional:

> *"First and foremost is to maintain good hygiene and sanitation. Everyone is sensitized to maintain good body hygiene and sanitation in his or her home; by washing hands with clean water and soap. We always educate our citizens about these things. Another thing is to avoid traveling to those countries where Ebola diseases were found unnecessarily. And also, to avoid eating wild animals that died spontaneously, because you can't know what killed them; and also to avoid eating bats of any kind, because they harbor Ebola virus; so, you can't choose which one that has it or doesn't have it"***IDIs-Rusizi.**
>
> *"Like we have said before, when people cross the border either legally or illegally, they are at a high risk of being infected by Ebola while in the Congo. What we mobilize people to do is to be vaccinated because the vaccine protects against at least 50% chances of being infected by increasing the immune system"***General community / Urban FGD, Rubavu.**

Discussion

This study aimed to explore knowledge, attitude, and practices of community members towards the Ebola Virus prevention strategies in the Western Province of Rwanda. The findings showed that majority of the respondents had high levels of knowledge, with negative attitudes toward the Ebola program before community engagement but demonstrated consistency in practicing EVD preventive measures.

When exploring knowledge about Ebola, our findings aligns with those of Buli et al. [34] in Guinea and Karuhije et al. [35] in Rwanda who reported that over 96% and 99.6% of their respondents had ever heard of EVD respectively. The high-level of knowledge is probably as a result of existing programs within the communities. Particularly in the Western Province of Rwanda, this attributed to the fact that even before the existence of the Unprecedented Movement to drive a Unified Rwandan Initiative for National ZEBOVAC Immunization (UMURINZI) program, the government of Rwanda two years ago through the Ministry of Health, had already started sensitizing the general Rwandan population about the existence of the EVD and its existence in the neighboring country, DRC which has been further harnessed by the UMURINZI program, where diverse communication channels were used [36]. Regarding the mixed information, our study findings aligns with those of Lakhe et al. [37] who found that some participants believed EVD was an airborne disease which can be transmitted through air droplets. The consistence of our findings with the other studies underscores the need for a sustainable and continuous public health initiatives when it comes to diseases control and prevention.

Additionally, our findings were similar to those of Buli et al. [34] where poor repondent attitude towards EVD programs were noticed. This was indicated by some strong believes that the vaccine itself was a weapon of destruction to their lives as humans and not acceptable by their various religions. This was aggravated by the rumors and side effects reported by family members who had received their 1st dose of the vaccine. Also, the fact that Rwanda has never experienced any EVD outbreak has led to some respondents developing a negative attitude toward EVD prevention methods. These findings are consistent with those of Jalloh et al. [29] in Sierra Leone and Karuhije et al. [35] in Rwanda, in which some respondents discriminated against EVD survivors out of fear that they were still contagious. However, this differs from the study conducted by Idris et al. [38] in Lagos State, where respondents had a positive attitude because they trusted their leaders and hence relied on the information they provided. Therefore, strategic initiatives must be tailored to address specific cultural, religious, and social dynamics within communities. In addition, building trust through effective communication and leadership is essential for improving public acceptance of health interventions like vaccines [39].

Despite the existence of negative attitudes demonstrated by some of respondents, this study found that the majority of respondents respected the proposed measures including handwashing with soap and water and non-consumption of animals such as baths or those found dead without a known cause. This contradicts with the study conducted by Musaazi et al. [30] in Uganda, where only few were engaged in preventive measures toward EVD including frequent hand washing with soap, avoiding physical contact with suspected Ebola patients, and avoiding burials involving contact with a corpse. The difference could be attributed to the Rwandan government's considerable efforts in availing washing stations at strategic sites, as well as risk communication and community engagement initiatives [40]. Both findings suggest that adherence to recommended practices can be driven by external factors such as infrastructure, enforcement, and public health campaigns, even in the presence of skepticism or negative perceptions toward the program.

Limitations and suggestions

Insights related to Knowledge, Attitude and Practices were collected through a qualitative survey based on a convenience sampling. This type of sampling method is commonly known for not being able to provide data representing the true population. Thus, these KAP findings must be interpreted with caution. In terms of time, our study data was two years old and not triangulated for broader conclusions. We were not able to understand community members' thoughts after the vaccine campaign but this did not play much impact on our findings since people were followed up and taught to understand the disease which eventually led to a high show-up rate for the vaccine at the end of the program.

We acknowledge that the approach utilized to choose study respondents might have introduced some bias, leading respondents to offer information solely to impress program implementers. Despite the mentioned pitfalls, we believe the responses provided reflected the true perceptions and ideas of this subset community members.

Conclusion

In our study, we reported the knowledge, attitude, and practices of a subset of community members towards the UMURINZI program in the Western Province of Rwanda. Our findings revealed that some respondents were aware of the EVD and the program, and had begun to adopt the positive attitudes and practices endorsed by program advocates. Though we have limited evidence, we believe the various community engagement activities

helped to improve KAP and thus program successes as reported elsewhere [24–26]. Therefore, for similar programs, effective community engagement and mobilization should be utilized to optimize desired behavior or actions in parallel with thorough evaluation of its impact.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41043-025-00741-5.

Supplementary Material 1

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All authors; Marie Michele UMULISA, Aline UMUTONI UWIZERA, Nnamdi EZEANOCHIE, Jozef NOBEN, Ellen Pagan INDOE, Malick KAYUMBA, Rosette BUSASA, Grace UMUTONI, Alice MUSHIMIYIMANA, Philbert KAYITARE, Roselyne INGABIRE, Patience SINDAYIGAYA, and Roseline Dzekem DINE, made substantial contributions to the conception and design of the study; acquisition of data; analysis and interpretation of data; drafting and revising the manuscript for important intellectual content, as well as approved the final version.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Competing interests

The authors declare no competing interests.

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