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Healthcare provider and patient perspectives on COVID-19 vaccination among persons with HIV, hypertension, and/or Diabetes mellitus at two regional referral hospitals in Uganda

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Abstract

Background People with chronic illnesses such as Human Immunodeficiency Virus (HIV), hypertension, and Diabetes Mellitus (DM) are a priority for Coronavirus disease (COVID-19) vaccination due to elevated risk of severe disease. We explored the perspectives and experiences of COVID-19 vaccination among these priority populations in Southwestern and Southcentral Uganda.

Methods Between January and April 2023, we conducted in-depth interviews with adult (≥18 years) persons living with HIV (PLWH), hypertension and/or DM ($n=30$) and key informant interviews with healthcare providers and managers ($n=12$) at Mbarara and Masaka Regional Referral Hospitals. We used the Behavioral and Social Drivers model to explore the factors that influenced COVID-19 vaccination. We coded the data using Dedoose software and analyzed them using thematic deductive analysis.

Results Motivations to take the COVID-19 vaccine included fear of COVID-19, observing the effect of COVID-19 or the vaccine on others, vulnerability from underlying illnesses, family and social support, health worker recommendation, vaccine benefits and trust in the vaccine. Fear of side effects and vaccine interactions with antiretroviral, antihypertensive or antidiabetic medications, misinformation, rapid vaccine development and rollout, inadequate sensitization, and healthcare providers' hesitancy hindered uptake. Furthermore, health system challenges like stockouts and long queues hindered uptake or dose completion.

Conclusion Fear of COVID-19, trust in the vaccine, family and social support facilitated COVID-19 vaccination uptake. Conversely, fear of side effects, vaccine and medication interaction, misinformation and inadequate sensitization hindered vaccine uptake. Effective communication strategies involving health workers and community leaders and sustained vaccine supply are crucial to improve COVID-19 vaccine uptake.

Keywords COVID-19 vaccination · HIV · Hypertension · Diabetes · Uganda

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1 Background

Emerging in late 2019, the coronavirus disease (COVID-19) pandemic posed a significant threat to global health security, resulted in about 3 million excess deaths and disrupted global mobility and trade [1]. People living with chronic conditions such as HIV, hypertension, and Diabetes Mellitus (DM) are at an increased risk of severe COVID-19 complications, including mortality [2]. While COVID-19 cases in Africa initially rose slowly, a surge occurred in mid-2020 with the emergence of new variants, particularly Delta and Omicron. COVID-19-related deaths doubled in countries with a higher burden of underlying chronic disease due to intersecting effects [3].

To control the COVID-19 pandemic, the World Health Organization (WHO) recommended that at least 70% of the population around the globe receive COVID-19 vaccines by mid-2022 [1]. During the vaccination rollout, priority was given to groups with underlying diseases like HIV, hypertension, DM, and heart disease. Despite progress in controlling COVID-19 through vaccination, by December 4, 2022, only 24.9% of Africa's population had completed the primary COVID-19 vaccination series [4]. Also, in Uganda, the overall vaccination uptake remained lower than desired [5, 6]. This disparity was particularly evident in Africa, the continent with the highest burden of people living with HIV (PLWH) [7]. For instance, a survey conducted in early 2023 in Southwestern and Southcentral Uganda found low vaccination completion (65.6%) compared to WHO's 70% target, especially among middle-aged and those with lower education, citing fear of vaccine side effects [8].

Suboptimal COVID-19 vaccination uptake in individuals with underlying health conditions highlights the need to study and understand the barriers and facilitators to vaccine uptake in this high-risk population. Studies have shown vaccination program barriers, including limited healthcare access and social factors such as poverty, lower education, stigma, and hesitancy among the general population [9–11]. However, data addressing perspectives and experiences surrounding COVID-19 vaccination in populations at elevated risk of severe COVID-19 outcomes in Africa are limited.

By understanding the barriers and facilitators to COVID-19 vaccine uptake, healthcare professionals and policymakers can develop targeted interventions to enhance vaccine confidence and increase uptake, ultimately reducing the risk of severe COVID-19 outcomes. In this qualitative study, we used the Behavioral and Social Drivers (BeSD) framework [12, 13] to explore the perspectives and experiences of PLWH, hypertension, and/or DM, as well as their healthcare providers, regarding COVID-19 vaccination in Southwestern and Southcentral Uganda.

2 Methods

2.1 Study context

We conducted the study at two regional referral hospitals in Southwestern Uganda from January to April 2023, in the context of mass COVID-19 vaccination campaign. The COVID-19 vaccination campaign was launched on March 10, 2021 [14]. The first phase of the vaccination campaign targeted high-risk and priority groups, including health workers, persons with comorbidities, teachers, humanitarian workers, and those aged 50 years or older [15]. The first COVID-19 vaccine available was Astrazeneca, while other vaccines, including Pfizer, moderna, and Johnson and Johnson were received later in the year. By June 2022, 47% of people with comorbidities had been vaccinated [15] while by early 2023, 66% of people with comorbidities had been vaccinated [8]. We conducted the study about a year post the last COVID-19 surge [16] and over a year post the last lockdown. At the time, primary series vaccination had been opened to all adult persons, and 6-monthly boosters for high-risk and priority populations [14].

2.2 Study design

We conducted an exploratory qualitative study [17] among adult PLWH, persons with hypertension and/or DM receiving care from two tertiary public hospitals in Southwestern and Southcentral Uganda from January to April 2023. We report results based on the Behavioral and Social Determinants (BeSD) framework, which was developed by WHO to provide a comprehensive approach to enhancing vaccination coverage by considering the behavioral and social determinants of vaccine acceptance and demand [13]. The BeSD framework is a comprehensive model that was developed, tested, and validated by WHO to provide decision-makers, program managers, and partners with tools and practical guidance for achieving a high vaccination uptake, including COVID-19 vaccination [12, 18]. The BeSD model consists of four key

domains: Thinking and feeling, social processes, motivation, and practical issues (Fig. 1). We followed the Consolidated criteria for reporting Qualitative research (COREQ) checklist (Supplementary file) to report our findings [19].

The study was conducted in the context of an ongoing COVID-19 vaccination campaign. At the time of the study, approximately 65.6% of persons with underlying chronic disease had been fully vaccinated against COVID-19 [8], which was below the WHO target of 70% by mid-2022 [20].

2.3 Study setting

We conducted the study at the HIV and non-communicable diseases (NCD) clinics at Mbarara Regional Referral Hospital in Southwestern Uganda and Masaka Regional Referral Hospital in Southcentral Uganda. Mbarara Regional Referral Hospital serves over four million people in 12 districts, while Masaka Regional Referral Hospital serves a population of over two million people in eight districts [8]. The HIV clinics at either hospital have over 10,000 active patients and run at least 4 times a week, while the NCD clinics have at least 2500 active patients with at least hypertension or DM in chronic care [21] and run twice a week.

2.4 Selection of study participants

We selected persons with HIV, hypertension, and/or DM, as well as healthcare providers working at the HIV and NCD clinics, vaccinators, and healthcare managers at the two hospitals and the districts. Our sample comprised of; (1) 30 persons with underlying chronic disease (HIV, hypertension, and/or DM) selected purposively based on age, sex, HIV status, and COVID-19 vaccination status to ensure maximum variation; (2) 6 healthcare providers (three per hospital), including doctors, ($n=2$) medical clinical officers ($n=1$), and nurses/vaccinators (n = 3), and (3) 6 healthcare managers (three per district) including the district health officials (DHOs, $n=2$), district immunization focal person($n=2$), and clinic managers ($n=2$). Before data collection, we enlisted all the potential participants and their contacts in a Microsoft Excel document. All enlisted participants were contacted and accepted to participate in the study.

2.5 Data collection

We conducted face-to-face, in-depth interviews with persons with underlying chronic disease(s) and in-person key informant interviews with healthcare providers and healthcare managers. We collected data using semi-structured interview guides. The qualitative research expert: CA, with a PhD in health sciences and extensive qualitative research experience, developed the interview guides in consultation with the research team based on the constructs of the BeSD

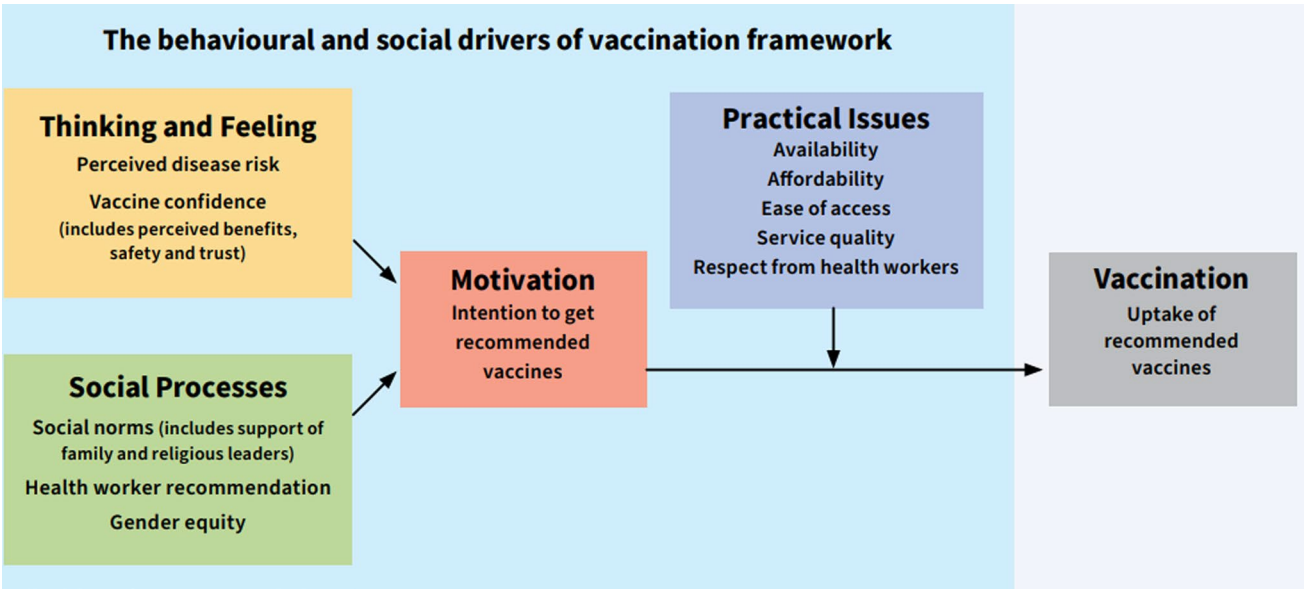

Fig. 1 The Behavioral and social drivers of vaccination framework. Adopted from the World Health Organization

framework. Three distinct interview guides were developed for persons with underlying chronic disease, healthcare providers, and healthcare managers. In the guides, we explored questions about COVID-19 vaccine knowledge and attitudes, COVID-19 risk perceptions, and experiences with the COVID-19 vaccine and vaccination campaign. The interview guides contained prompts to gather more information beyond the questions in the guides. Interview guides for persons with underlying chronic diseases were translated into the local languages. The data was collected between January and April 2023 by two well-trained research assistants (RAs), MK and FMB, with at least a Bachelor's degree in humanities, experience in qualitative research methods and were fluent in the local languages. Each day, the RAs checked the Excel document to identify and contact participants and schedule interviews. On the appointment day, the RAs prepared study documents and met participants in a private room at the health facility (persons with underlying chronic disease(s) and healthcare providers) or their offices (healthcare managers) to ensure privacy. Furthermore, each participant was assigned an identification number for anonymity. The interviews lasted 40–60 min and were audio-recorded. Each participant received the equivalent of $5 compensation for his/her time.

2.6 Data management and analysis

The audio recordings of the interviews were transferred immediately after the interview to password-protected computers, backed up on a remote server, and thereafter deleted from the recorder. The audio recordings for the healthcare providers and managers were transcribed verbatim, while those for persons with underlying chronic disease(s) were translated into English using meaning-based translation [22]. Transcripts were reviewed against the recordings by the qualitative research expert for accuracy.

We used deductive thematic analysis to analyze the data guided by the principles of theory-driven thematic analysis by Braun and Clarke [23]. The transcripts were reviewed by the researchers to synthesize and gain a deeper understanding of the meanings of the data to the point of saturation. We iteratively developed a codebook employing deductive approaches [24]. The initial codebook, developed by three members of the research team (CA, MK, BB), was informed by the overarching questions in the interview guides, guided by the BeSD framework. The codebook was reviewed and refined by the 8-member research team to develop a final codebook. Data coding was done using Dedoose software and organized in five domains of the BESD framework. We present below supportive evidence in the form of transcript excerpts contextually grounded by classifying individuals based on participant category, sex, HIV status, and vaccination status.

3 Results

3.1 Sample characteristics

We conducted 30 in-depth interviews with persons with underlying chronic disease and 12 key informant interviews with the healthcare providers and healthcare managers as summarized in Table 1.

We present our findings organized by the domains of the BeSD framework, as summarized in Table 2. For each thematic area, we also provide a detailed narrative supported by selected participant quotes to illustrate key insights.

3.2 Thinking and feeling

3.2.1 Perceived risk of acquiring COVID-19 or severe COVID-19 facilitated vaccine uptake

The decision to receive the COVID-19 vaccine was influenced by the participants' perception of risk of COVID-19 infection. Participants associated their age (for those above 50 years) and existing underlying conditions such as HIV, DM, and/or hypertension with increased susceptibility to COVID-19.

> Honestly, I am at risk because I'm already past the age of 50 years, where you can easily get infected with the virus. I'm also dealing with illnesses like diabetes and hypertension, so that poses a great risk, and that's why I rushed to get vaccinated. (male participant with diabetes and hypertension, vaccinated)

Along with the underlying condition, the feelings of risk were exacerbated by the nature of the work that clients did. Participants with frequent client interaction were prompted to get vaccinated as this participant narrates.

Table 1 Characteristics of participants in in-depth and key informant interviews

Participants	Category	*n* (%) or median [IQR]
In-depth interviews		
Persons with underlying chronic disease (*n* = 30)		
Age		47 [38, 55]
Sex	Male	11 (37%)
	Female	19 (63%)
HIV status	Positive	21 (70%)
	Negative	9 (30%)
Comorbidity[a]	HIV	21 (64%)
	HTN	6 (18%)
	DM	4 (18%)
COVID-19 vaccination status	Vaccinated	25 (83%)
	Unvaccinated	5 (17%)
Key informant interviews		
Health workers (*n* = 6)		
Sex	Male	3 (50%)
	Female	3 (50%)
Cadre	Doctors	2 (33.3%)
	Nurses/vaccinators	3 (50%)
	Clinical officers	1 (17.7%)
District	Mbarara	3 (50%)
	Masaka	3 (50%)
Healthcare managers(*n* = 6)		
Sex	Male	4 (66.7%)
	Female	2 (33.3%)
Position	District Health officer	2 (33.3%)
	Clinic manager	2 (33.3%)
	Immunization focal person	2 (33.3%)
District	Mbarara	3 (50%)
	Masaka	3 (50%)

[a]Total exceeds *n* = 30 because some participants had more than one comorbidity

> I knew I was at risk because of the nature of my job, I meet many clients at the clinic, and this only puts me at risk of getting infected. Then another scenario is that my boss tested positive for COVID-19, yet we were working in the same environment, this made me decide to get vaccinated because of the risks around getting infected (female PLWH, vaccinated)

Individuals who anticipated they would suffer from a severe form of COVID-19 if they contracted the disease were more motivated to get the vaccine when the campaign started for fear of the negative consequences associated with severe disease, including death. Moreover, some of them had observed others succumb to the disease.

> I asked myself that I am already living with HIV. If I don't go early and vaccinate, won't COVID-19 come and kill me, and I leave my children orphans young as they are? So, I decided and rushed to the clinic and took the first jab [injection]. (female PLWH, vaccinated)

3.2.2 Vaccine confidence, including perceived benefits and the protection the vaccine offered, facilitated vaccine uptake

Participants felt safer and believed their risk of contracting COVID-19 decreased after vaccination. They also mentioned that vaccination would lessen their need for wearing protective gear.

Table 2 Summary of facilitators and barriers to COVID-19 vaccination uptake per the domains of the BeSD framework

BeSD domain	Summary of findings	
	Facilitators	Barriers
Thinking and feeling	Perceived risk of acquiring severe COVID-19 increased vaccine uptake Feeling of vulnerability was higher among those above 50 years and those whose jobs involved frequent interaction with different people Observing others suffering from severe COVID-19 or death influenced decisions to get vaccinated Vaccine benefit, including reducing the risk of contracting COVID-19 and eliminating the need for constant use of protective gear	Concerns about vaccine safety (side effects, interactions with existing medications) The speed of vaccine development The rapid rollout of the COVID-19 vaccine Misinformation about the potential for the COVID-19 vaccine to cause infertility, cancer, stroke Misconceptions such as belief that the vaccine was introduced as a form of African population control
Social processes	Family, friends, and health workers played a crucial role in promoting vaccine uptake through encouragement and sharing positive experiences Faith and community leaders encouraged vaccination Observing public figures and health workers taking the vaccine increased public's confidence about the safety of the vaccine	Health worker hesitancy
Motivation	Participants were motivated by the desire to protect loved ones and avoid spreading the virus Workplace and travel requirements, along with fear of another lockdown, contributed to vaccination decisions	
Practical issues	The vaccine was offered at no cost to the users	Long queues at vaccination sites Vaccine shortages, especially of booster doses Limited or no health education from health workers Lack of clear guidance for health workers about the vaccine Disrespect and cruelty from some of the health workers Poor planning and insufficient health workers delayed vaccinations

I feel safe knowing that I am vaccinated and the risk of being infected with COVID-19 reduced since am not good at wearing the mask. I also used to think COVID-19 was not there, but now I know the risk is there but reduced (female PLWH, vaccinated).

3.2.3 Safety and trust concerns with the vaccine hindered uptake

Safety and trust concerns with the COVID-19 vaccine hindered uptake of either the first or the subsequent doses. Side effects such as feeling dizzy/drowsy, fatigue, nausea, and excessive pain at the injection site, among others, were frequent among those who were vaccinated. For some, the effects lasted longer than expected, hindering those who had not vaccinated and prompting some who had vaccinated to regret their decision.

Pain was a lot, and I even spent three weeks without working because of the adverse effects of the vaccine. I would not get vaccinated again if I had to. (male PLWH, vaccinated)

Some participants also expressed concerns about the vaccine potentially interacting with the medication they were taking and worsening their underlying condition.

I refused to get vaccinated because I am HIV positive and on ART. I thought that the vaccine would weaken me since I am already taking ARVs. I was worried about what would happen to me after getting vaccinated. …The medication I am taking is strong itself, I could not add on the COVID-19 vaccine. (female PLWH, unvaccinated)

Some of the feared side effects were based on misconceptions and misinformation about the vaccine. Information circulating on social media, newspapers, or television and from friends or community members that the vaccine would cause infertility, impotence, stroke, cancer, and death amplified the fears. Moreover, there was no post-vaccination surveillance beyond the observation at the health facilities.

People would scare us that when you take the COVID-19 jab, you get a stroke… or collapse after taking it. …Like the youth, they feared that they are still young, and they might take the vaccine, and it destroys their fertility or bring other side effects because there was no follow-up on people after taking the vaccine… (female PLWH, vaccinated)

Participants also expressed trust concerns about the vaccine's rapid development and roll-out and the motive behind the vaccines. Some people who believe that HIV was introduced in Africa as a way of population control expressed similar concerns about the COVID-19 vaccines. They believed that health workers were being used as agents of that motive. The situation was worsened by some preachers and public figures who reinforced this narrative and instilled fear in people.

We all thought that the whites (referring to white people) were just finding a way of killing us all. They first introduced HIV/AIDS to human beings, and now they invented COVID-19 vaccines. Even during prayers at church, preachers would encourage us to pray so hard because this disease would not spare anyone. We used to think that the vaccinators had intensions of killing us. We thought that since COVID-19 was not strong enough to kill all of us, they decided to invent a vaccine that would kill us all. (female PLWH, unvaccinated)

Some participants preferred to use other protective measures like wearing masks and social distancing instead of taking the vaccine due to the mistrust for vaccines.

……I decided to stop moving from place to place, always wear masks and do all the other preventive measures I can so that if I am to get infected, I get infected from home but without getting vaccinated (female PLWH, unvaccinated).

Some health workers, including those involved in the vaccination, had similar safety concerns. These concerns stemmed from the rapid development of the vaccines without "completing all testing phases", the lack of information about their long-term safety, and the spread of misinformation about the vaccine's side effects on social media and other news platforms.

… the information was not clear. They were bringing the vaccine to the country and needed health workers to take it up, but whenever we would read, it was as if it is under study. I was worried and wondered why is it being introduced to the country if it is still under study. Why they can't first investigate and reach a point where they feel it is safe for everyone. Honestly, even we who were giving the vaccine were also worried about the long-term effects. (female healthcare provider)

Healthcare workers who displayed hesitancy towards vaccines inadvertently eroded public confidence. The perception that they were promoting vaccinations while not being vaccinated themselves fostered distrust and dissuaded others from seeking the vaccine.

> We were told to go and vaccinate and yet health workers were not vaccinating, they lied to us by faking their vaccinations to encourage the rest of us to get vaccinated…. So, the fact that we heard how most health workers were not getting vaccinated also discouraged us from getting vaccinated. (female PLWH, unvaccinated)

3.3 Social processes

3.3.1 Family and friends encouraged COVID-19 vaccination

The decision to get vaccinated was influenced by discussions with family and friends, including an HIV-positive friend who had been vaccinated without side effects, especially if they had a similar health status. For some, the decision was reinforced after observing others taking the vaccine without side effects.

> I first talked to a friend who is also HIV positive, and she encouraged me to go ahead and vaccinate and that she also vaccinated and she did not experience any side effects. (female PLWH, vaccinated)
> People who had already been vaccinated would tell us that it was not very painful, so I decided to go and see for myself, and I didn't find it painful at all. At first, I was worried about the side effects but because I saw other people getting vaccinated, I was encouraged and, in the end, I got vaccinated. (male PLWH, vaccinated)

Faith and religious leaders also promoted COVID-19 vaccination uptake. They encouraged people to get vaccinated, especially when vaccination drives were held at church premises, as this participant explains. "I left home when I had not decided to vaccinate, but when our priest encouraged everyone to go and vaccinate, and because the services were already in the church compound, I picked up the courage from there and then". (female participant with diabetes, vaccinated).

Furthermore, individuals were encouraged to receive the vaccine after seeing public figures such as the president getting vaccinated. This helped build trust and confidence in the vaccine, as it indicated that thorough research had been done to ensure its safety for everyone. "I got worried about the possible side effects of the vaccine, but because the government had encouraged us and we had seen the president himself get vaccinated, I decided to do it also". (male PLWH, vaccinated).

Other people were vaccinated upon health workers' recommendations or upon health workers demonstrating that the vaccine is safe by taking the vaccine. Health workers helped to provide information and allay fears about side effects, re-assuring clients about vaccine safety and dispelling myths and misinformation and build confidence in the vaccine. In some cases, providers gave their contacts to clients to call them whenever they experienced any side effects.

> I felt very confident that even if I acquire COVID, it won't harm me because the health providers told us that when one acquires it when he or she is already vaccinated it cannot weaken him or her especially when one seeks treatment in time. They can easily get rid of it than one who has not yet vaccinated (female PLWH, vaccinated)
> At some point, ...we had to demonstrate that the vaccine is safe by taking the vaccine so that people see us take the vaccine. I remember in greater Mbarara, myself, the director of the Regional Referral Hospital and the RDC (meaning the Resident District Commissioner), we took the first three jabs in this region. (male healthcare manager)

3.4 Motivation

3.4.1 Desire to protect others promoted vaccine uptake

Some participants reported feeling motivated to get vaccinated because they wanted to protect themselves and their loved ones from contracting COVID-19 and to reduce the spread of the virus.

> One thing that motivated me to get vaccinated is not to get infected with COVID-19 and also to reduce the spread of the infection. (female PLWH, vaccinated)

3.4.2 Vaccine mandates at workplaces, travel destinations, and the government, and fear or repeat restrictions also prompted clients to get vaccinated

Participants reported not being allowed at some workplaces without presenting a vaccination card, which prompted them to vaccinate. However, in such cases, participants felt pressured to get vaccinated despite not being confident about the vaccine.

> …We were forced to get vaccinated, and whoever wasn't vaccinated was not allowed to come to work. Our director complained that those not vaccinated are putting others at risk of getting infected with COVID-19. Because it became a policy and mandatory, I had to get vaccinated; we had to present our vaccination cards before entering the premises of work (male PLWH, vaccinated)

Providers reported that several participants got vaccinated amidst a rumor of a looming government policy that unvaccinated individuals will not be allowed to travel or attend public gatherings, including churches and mosques, and will be denied financial services in the banks. Additionally, providers mentioned that many people sought vaccination due to concerns about the potential reinstatement of a COVID-19 lockdown. After experiencing social isolation, disruption of social routines, unemployment, financial strain, and food insecurity during previous lockdowns, they did not want to go through it again. People understood that vaccination and preventing the spread of COVID-19 were the only ways to avoid another lockdown.

> Most people were motivated because there was some information that came from the government saying that, if you are not vaccinated, you will not be allowed to travel, be in gathering areas, for example, parties or even church, or get services in banks, so people were forced by those words to come and get the vaccine otherwise the majority would actually not get it. (female healthcare provider)
> It was mainly the fear of lockdown, people were affected during that period so they thought the lockdown would be lifted if they vaccinated. (female healthcare manager)

3.5 Practical issues

Service quality issues such as inefficiency in executing the vaccination program, long queues and lack of clear information from health workers hindered the vaccination uptake as follows:

3.5.1 Inefficiency in executing the vaccination program

Participants highlighted several inefficiencies in the vaccination program, including delays in vaccine delivery to vaccination sites, insufficient health workers to manage high client volumes, and instances of vaccines being unavailable on scheduled days. These issues led to long wait times at health facilities, and large queues. There were also reports of vaccine shortages, leading to delays in receiving second or booster doses, despite individuals incurring transportation costs to reach the facility, all of which were attributed to poor planning.

> The planning wasn't efficient because we would get to the health centers and there are no vaccines, yet we had put in our transport and time, vaccines were not at the vaccination points in time. Health workers were not enough yet the numbers are big which really made us delay at the vaccination centers … (female PLWH, vaccinated)
> Yes, even here at this hospital, they would also run out of the vaccine, especially when people would come to get the second dose and booster (male PLWH, vaccinated).

3.5.2 Lack of information support from the health workers and government

Some participants have expressed concern about not receiving enough information about the vaccines from the government and health workers, especially regarding the potential side effects of the vaccines. As a result, experiencing side effects by some clients discouraged others to get vaccinated. At the vaccination points, participants did not have

a chance to receive any health education or to ask questions, especially towards the middle of the campaign. Health workers only focused on clearing the long queues and paid less attention to health education.

> They did not give us any information. When I went for vaccination, people were many, …so the aim was to vaccinate. There was no time for any health education. We did not get any chance for the health workers to tell us anything related to vaccination and vaccines (male PLWH, vaccinated).

Another participant also narrated her experience:

> Not really, because the number of people was overwhelming, and there was no time for any discussions. Maybe those who came when the vaccination commenced received health talks about what to expect when they take the vaccine, but as numbers increased, the health talks were stopped (female PLWH, vaccinated).

In some cases, participants perceived the failure to provide health talks yet continuing to vaccinate as disrespect and lack of regard for the clients by health workers. Some health workers were harsh to clients such that even those who vaccinated did not get a good experience, as this male participant narrates:

> At the vaccination site, the health providers were really harsh and talked badly to us who had come to get the vaccine, I think they got tired because the number of people was really huge; they would vaccinate as if we were cows, the experience was really not good, and next time it should change (male PLWH, vaccinated).

Some participants ended up avoiding vaccination altogether:

> …those who were vaccinating did not have time to explain to people about the vaccine its possible side effects, there was no time for that, what they were doing was just to call people to go and vaccinate and for me, I would not just accept. I decided to leave other people first vaccinate and if I am to take it, I go among the last people to vaccinate. (male PLWH, unvaccinated)

Health workers reported a shortage of vaccinators to manage the high patient volume, especially during the initial phase of the vaccination campaign. The staff was already burdened with a substantial workload, which was further strained by the demands of the campaign. Unfortunately, as one provider explained, the Ministry of Health did not provide additional staff to some centers.

> We were only three people doing general immunization for babies and mothers, and when COVID came, we were the same people in that section..., ...so we were over-stretched, and it was really overwhelming. ... Some people left because they waited for so long and went back unattended too (female healthcare provider)

4 Discussion

In this qualitative study, we identified both the perceived risk of COVID-19 and vaccine confidence as key factors influencing vaccination decisions of PLWH, hypertension, or Diabetes Mellitus in Southwestern and Southcentral Uganda. We employed the BeSD framework to understand participants' perspectives and experiences regarding COVID-19 vaccination. The WHO recommends this framework as a tool for prioritizing and implementing effective vaccination improvement strategies [18]. Those fearing severe illness from the virus or witnessing COVID-19's impact on others and feeling vulnerable due to comorbidity were motivated to seek and uptake the vaccine. Additionally, trust in the vaccine's benefits and safety, including enabling people to overcome restriction mandates and a return to normalcy, encouraged uptake. It would be crucial to identify the most effective and sustainable nudging approaches for different contexts, including the timeliness of such strategies. However, some participants expressed concerns about side effects and limited information about long-term effects, highlighting the need for clear communication and addressing vaccine hesitancy [8]. Perceived risk of severe COVID-19 emerged as a significant motivator and could be capitalized on as an important nudge for encouraging vaccinations among persons at highest risk of the disease morbidity or mortality. Sharing positive stories of vaccinated individuals with similar health vulnerabilities could further encourage vaccination in this group [9, 25].

Social norms and trust in public and political figures also influenced COVID-19 vaccination decisions. Family and religious leaders who encouraged vaccination positively influenced uptake, similar to reports from Ghana [26]. However, our findings differ from those reported by Olagoke and colleagues, which showed a significantly negative association between religiosity and COVID-19 vaccination intention [27]. Notably, religiosity and belief in

recommended vaccine use by social influencers were a crucial mobilization strategy for mass COVID-19 vaccination in India [28]. Conversely, witnessing healthcare workers hesitant about vaccination undermined public confidence. Our findings complement reports in Ethiopia showing healthcare workers refusing COVID-19 vaccines [29, 30], citing concerns about vaccine side effects (69.6%) and inadequate studies (61.6%) as the predominant reasons for COVID-19 vaccine hesitancy among healthcare workers who opted out of vaccination [30]. This suggests a need for targeted interventions to address these anxieties among the healthcare workforce ahead of vaccination campaigns. Healthcare worker education focusing on vaccine safety data and long-term studies could be crucial to improve vaccine confidence and uptake in this population [31].

Social media and news reports with misinformation about the vaccine's safety also fueled anxieties [32]. The influence of misinformation spread on various social media platforms and the overall declining COVID-19 cases were linked to non-vaccination [11, 25]. These findings emphasize the importance of addressing misinformation through effective communication strategies and involving trusted community leaders in promoting vaccine acceptance. Trust in the vaccine's benefits and safety, including protection from severe COVID-19 and controlling the COVID-19 spread, thus ending the restrictions encouraged uptake. These findings align with evidence that supports such strategies to promote vaccination uptake [33].

Vaccination certificates increasingly became prerequisites for accessing public services, essential workers, and in-country and cross-border travel, particularly for air transport [34]. However, some participants expressed concerns about side effects and limited information about long-term effects. Taken together, these results highlight the need for clear communication and addressing vaccine hesitancy to improve the performance of vaccination programs.

While participants feeling disrespected by healthcare workers during vaccination wasn't a major theme, respectful interactions and clear communication are important to build trust and encourage vaccine uptake. These studies in Nigeria and Ethiopia demonstrate the importance of respectful interactions and communication in overcoming vaccine hesitancy across Africa [10, 11]. Healthcare workers can play a vital role in increasing vaccine uptake on the continent by prioritizing patient-centered communication and building trust [35, 36]. This highlights a potential hesitancy even among those who perceive the vaccine favorably. This emphasizes the importance of addressing early concerns to encourage timely vaccination.

Also, fear of negative interactions between the vaccine and antiretroviral therapy deterred PLWH from getting vaccinated. COVID-19 vaccine hesitancy in China identified a lack of awareness about the safety of COVID-19 vaccines for people on ART [37]. Educational efforts promoting the safety of vaccination for this population are crucial [38]. Practical challenges like vaccine stock-outs and long clinic wait times also hindered uptake. At the start, vaccine rationing was common. Ensuring consistent vaccine availability and improving service delivery, including supporting the vaccination campaign with additional human resources, can help overcome these barriers.

Our study had strengths. First, we triangulated data from the perspectives of clinicians who provide HIV and COVID-19 vaccination and PLWH, hypertension, or diabetes, the vaccine beneficiaries. Second, we used an innovative BeSD framework to easily compare results across contexts and sub-populations and for reproducibility. However, our study also had some limitations. First, our findings may not be transferable to the entire population with underlying health conditions due to our focus on PLWH, hypertension, or Diabetes Mellitus. However, the three diseases represent the most considerable population with chronic illnesses. Second, we used deductive, theory-based thematic analysis, based on a priori codes from the BeSD framework. This approach is quite rigid, unable to encompass all the possible themes and may ignore emerging themes about vaccination. However, the BeSD framework is validated and recommended by WHO for increasing vaccination uptake. We utilized the framework to make our results reproducible in different contexts. Third, we did not rank participant responses to provide insight into which factors were more prominent in driving COVID-19 vaccination uptake, making it difficult to guide policy makers on which factors should be prioritized. Lastly, we relied on self-reported information from participants potentially impacted by social desirability bias, where participants might report information in a way, they believe is socially acceptable. However, we triangulated our findings by obtaining the perspectives of clients and their providers.

In conclusion, perceived COVID-19 risk, vaccine confidence, social influences, and system-level factors affected COVID-19 vaccination among PLWH, individuals with hypertension, and or Diabetes Mellitus in Southwestern and Southcentral Uganda. Our results highlight the need for multifaceted interventions to improve vaccination uptake among people with underlying chronic health conditions. Effective communication strategies addressing concerns about safety, side effects, and misinformation are essential. Furthermore, involving trusted healthcare providers and community leaders, along with ensuring vaccine accessibility and respectful service delivery, can significantly improve vaccine coverage and protect these vulnerable populations from COVID-19 or other vaccine-preventable

diseases. There is a need for further research to explore the experiences of individuals with a wider range of health vulnerabilities.

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Data availability All data generated or analysed during this study are included in this article as a supplementary file.

Declarations

Ethics approval and consent to participate This study was conducted in accordance with the Declaration of Helsinki as revised in 2019 [39].The study was approved by the Makerere University School of Medicine Research and Ethics Committee, approval # Mak-SOMREC-2021-201, and the Uganda National Council of Science and Technology, approval # HS1855ES. We obtained administrative clearance from the participating hospitals and districts to access participants. All participants provided written informed consent for participation and audio recording on their own, without requiring a third party. The interviews for persons with underlying chronic disease(s) were conducted in the participant's language of preference, while the key informant interviews were conducted in English.

Consent to publish All authors listed have consent to publish this manuscript in the Discover Social Sciences and health journal.

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