COVID-19 Vaccine Hesitancy among Health Providers at Kenyatta National Teaching and Referral Hospital Nairobi-Kenya

Phelix Okello * , Vallery Ogello , Nicholas Thuo , Gakuo Maina , Paul Mwangi , Peter Mogere , Paul Mutua , Harrison Mwenda , Linnet Ongeri , John Kinuthia , Nelly Mugo , Kenneth Ngure

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Article

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Phelix Okello [1,*], Vallery Ogello [1], Nicholas Thuo [1], Stephen Gakuo [1], Paul Mwangi [1], Peter Mogere [1], Paul Mutua [1], Harrison Mwenda [2], Linnet Ongeri [2], John Kinuthia [2], Nelly Mugo [1] and Kenneth Ngure [3]

[1] Partners in Health Research and Development, Center for Clinical Research, Kenya Medical Research Institute, Nairobi, Kenya
[2] Kenyatta National Teaching and Referral Hospital, Kenya
[3] School of Public Health, Jomo Kenyatta University of Agriculture and Technology, Nairobi, Kenya,
* Correspondence: pokello@pipsthika.org; Tel.: +254702016169

Abstract: Understanding HCPs COVID-19 vaccine concerns can provide critical insights to optimize success of the vaccine rollout program as they are a trusted source of health information to patients and the general population. We sought to understand reasons for health care providers' COVID-19 vaccine hesitancy in Kenyatta National teaching and referral Hospital. From April to July 2021, we interviewed 60 HCPs purposively sampled from the Infectious Disease Unit (IDU) (n=20) and other departments (n=40). We analyzed data using inductive and deductive approaches to understand reasons for COVID-19 vaccine hesitancy. The HCPs had a median age of 37 years, (Interquartile range: [IQR 20.0-58.0]), 57% were female, 30% nurses among other cadres. Most HCPs cited low confidence in the vaccine such as mistrust in healthcare system and government, vaccine safety and efficacy concerns. Constraints such as uncertainty about the second vaccine dose availability, and misinformation caused hesitancy. Further, few were reluctant receiving the vaccine because of perceived herd immunity from a recent COVID-19 infection, and the need for more information before deciding. The study highlights the need to address any misinformation about vaccines safety and efficacy, and ensure accurate information is easily accessible to HCPs which can translate to higher vaccine uptake.

Keywords: COVID-19 vaccine; hesitancy; healthcare providers; Kenya

1. Introduction

The COVID-19 disease is an extremely contagious respiratory illness caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), the disease emerged as a global threat in 2019, leading to widespread psychological, public health, and economic concerns[1]. COVID-19 was declared a global health pandemic in March 2020[1,2]. As of March 2021, 120 million cumulative cases and more than 2.6 million deaths had been reported worldwide[3]. In Kenya, the first case was reported on March 2020, with 211,828 confirmed cases and over 4,000 deaths by August 2021[4]. The pandemic strained the healthcare systems globally, placing health providers at high risk due to infection controls and erratic medical supplies[5,6]. Initial estimates in 2020 suggested that health providers could represent 10-20% of all diagnoses[7]. With no specific treatment available, the World Health Organization (WHO) recommended preventive strategies, and the development of the COVID-19 vaccine an important response to mitigate the pandemic's impact[8,9]

Vaccination has been demonstrated to significantly decrease the spread of infectious diseases and its role in disease control, eradication, and elimination has been recognized and offers protection for more than a particular disease in individuals(10). The COVID-19 vaccine development process

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was started in 2020 and by 2021 March, there were 76 vaccines in clinical trials on humans with 6 vaccines approved for use[11]. As of December 2021, 5 out of the approved vaccines for full use of were available in Kenya[12]. HCPs being at the frontline for vaccination promotion and advocacy, the WHO and Centre for Disease Control (CDC) had prioritized them to receive the COVID-19 vaccine, especially working in a limited resource setting[13]. They were deemed most likely to contract and subsequently transmit the disease compared to the general population[14,15]. Despite the distribution and availability of vaccines in several countries, uptake is still a major problem[16]. The strategic advisory group of experts on immunization (SAGE) working group defined vaccine hesitancy as "delay in acceptance or refusal of vaccination despite availability of vaccination services". Vaccine hesitancy is context specific, varying across time, place and vaccine type, and is primarily influenced by psychological factors, such as perception of risk[17].

The general public shows great trust in HCPs therefore, ensuring their buy-in, is important for greater public support for vaccines. HCPs delay of acceptance or refusal to receive the vaccine may slow down COVID-19 mass vaccination[18]. Given the paucity of data regarding vaccine hesitancy among health providers particularly in low- and middle-income countries (LMICs), there is a need to understand the reasons underlying COVID-19 hesitancy among this population. We conducted a phenomenological qualitative study among HCPs to understand their hesitancy towards receiving the COVID-19 vaccine.

2. Methods

2.1. Study Procedures and Participants

Between April to August 2021, we conducted in-depth interviews (IDIs) among HCPs at Kenyatta National Referral Hospital, Kenya. We employed stratified purposive sampling to enroll clinical care providers (medical officers, clinical officers, nurses), pharmacy staff (pharmacists and pharmaceutical technologists), and laboratory technologists among other professional roles. Sampling was based on health providers' placement in either the infectious disease unit (IDU) (n=20) or other units outside the infectious disease unit (non-IDU) (n=40). Eligible participants were those actively providing health care services at either the IDU or non-IDU of the Kenyatta National Referral Hospital, willing and able to provide informed consent. A research assistant initiated a call with a potential participant via a phone using a predefined recruitment script (Supplemental materials 1). Participants who completed the form, upon verification by the research assistant, were contacted for in-depth interviews conducted either through Zoom or phone.

2.2. Study Setting

This research study was carried out at Kenyatta National Hospital, Kenya's largest teaching and referral hospital situated in Nairobi. Notably, this healthcare facility played a crucial role in admitting a substantial number of COVID-19 cases.

2.3. Data Collection

All interviews were conducted in English by experienced social scientists who took part in a 2-day protocol-specific training including; study objectives review, qualitative interviewing techniques, semi-structured interview guide, and qualitative research methods. The social scientists developed semi-structured interview guide using the 5C model of vaccine hesitancy to explore participants' and colleagues' opinions about the COVID-19 vaccine and reasons for vaccine hesitancy. The guide also explored participants' suggestions to improve vaccine uptake among them and the general population. All interviews were conducted remotely either via Zoom or phone based on participants' preference. Interviews were voice recorded using a digital recorder and securely uploaded to a password-protected computer. The interviews lasted between 30-60 minutes and were transcribed verbatim.

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2.4. Data Analysis

Experienced social scientists (PO and VO) reviewed the interview transcripts to ensure consistency, clarity, and completeness, and subsequently coded supported by Dedoose software (version 8.3.35) (Sociocultural Research Consultants, LLC, Los Angeles, CA, USA), a web-based application for managing, analyzing, and presenting our qualitative data[19]. The two social scientists developed a thematic coding framework based on the topics covered in the interview guide. We used deductive and inductive content analytic approaches to identify emerging themes, and organized our findings within the 5c model of factors influencing vaccine hesitancy and acceptance including; confidence, convenience/constraints, complacency, calculation, and collective response[20]. Discrepancies were discussed during the first stage of the coding process until a consensus was reached. All the transcripts were coded after inter-coder agreement was reached. Analytic reports were then generated for specific themes to describe study findings, providing a detailed and nuanced understanding of the participant's perspectives related to COVID-19 vaccine hesitancy.

2.5. Ethical Consideration

Kenya Medical Research Institute Scientific and Ethics Review Unit (KMRI-SERU) approved the study. Consent forms were electronically sent to participants' email addresses for reading and signing. The research assistant ensured the correct signing of consent forms and shared a survey form to gather participants' demographic information.

3. Results

3.1. Participant Demographic Characteristics

Participants had a median age of 37 years, (Interquartile range [IQR] 20-58), 56% (34/60) were female. Majority were nurses and doctors 18(30.0%) and 11(18.3%) respectively. The majority of 90% (54/60) of the respondents had a known COVID-19 contact. As in **Table 1**

Table 1. Participant demographic characteristics.

	Age		**Sex**		**Contact with COVID-19-positive patient**	
Demographic characteristics	Mean (SD)	Median [Min, Max]	Female	Male	Yes	No
Clinical Officer (N=3)	38.0 (2.65)	39.0 [35.0, 40.0]	2 (66.7%)	1 (33.3%)	3 (100%)	0 (0%)
Medical Doctor (N=11)	35.5 (8.74)	35.0 [27.0, 58.0]	8 (72.7%)	3 (27.3%)	10 (90.9%)	1 (9.1%)
Lab Technologist (N=7)	38.7 (6.10)	38.0 [32.0, 48.0]	4 (57.1%)	3 (42.9%)	6 (85.7%)	1 (14.3%)
Nurse (N=18)	41.4 (11.1)	45.0 [20.0, 58.0]	12 (66.7%)	6 (33.3%)	17 (94.4%)	1 (5.6%)

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Pharmaceutical Technologist (N=5)	40.0 (6.36)	38.0 [32.0, 47.0]	2 (40.0%)	3 (60.0%)	5 (100%)	0 (0%)
Other Cadres (N=16)	35.1 (7.97)	32.0 [26.0, 53.0]	6 (37.5%)	10 (62.5%)	13 (81.3%)	3 (18.7%)
Total (N=60)	38.1 (8.88)	37.0 [20.0, 58.0]	34 (56.7%)	26 (43.3%)	54 (90.0%)	6 (10.0%)

3.2. Qualitative Findings

Low confidence in the COVID-19 vaccine including mistrust in healthcare system and government, vaccine safety and efficacy concerns were mentioned by health providers as reasons for vaccine hesitancy. They reported that they were hesitant to receive the vaccine as they perceived its development process was rushed and that the reports from the media highlighted the vaccine's potential and experienced side effects from people who got vaccinated. Additionally, constraints such as uncertainty about the second vaccine dose availability, misinformation, and inadequate vaccine knowledge were mentioned as reasons for poor vaccine uptake. Further, health providers were reluctant to receive the vaccine because of perceived herd immunity from a recent COVID-19 infection, religious and conspiracy theories, and seeking information before making decisions as to vaccination. Health providers suggested the need to have well planned strategies in place to ensure reliable supply of the vaccine and that public sensitization of new vaccines should be prioritized before roll-out to improve uptake. We highlighted our key findings in **(Table 2).** The themes and illustrative quotes are described in the section below;

Table 2. Summary of findings using the 5C model.

5Cs: Construct	**Theme**	**Quotes**
Confidence	Vaccine efficacy concerns	*"But there are fears…a lot of information we are getting is that it does not protect you from acquiring COVID-19. So, why must I get vaccinated if it is not going to protect me?"* **(Male, Laboratory technologist, IDU)**
	Vaccine safety concerns	*"Its development was rushed. Much is not known about it in terms of its long-term effects. And there is not much information given about the vaccine, which makes people have a lot of conspiracy theories about it"* **(Female, Nurse, non-IDU- 020)**
	Mistrust in healthcare system	*When other people are allowed to import (COVID-19 vaccine) it… we won't know whether it is the right one or which one…corruption at bodies mandated to look at matters' health"* ***(Male, Medical officer, non-IDU)***
Convenience/Constraints	Uncertainties about second vaccine dose availability	*If I get the first vaccine and I miss the second one what will happen? You see they need that assurance, that if I get the first dose will I get the second one?"* **(Female, Laboratory technologist, IDU)**

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	Inadequate vaccine knowledge	*"I have tried to look for information from those who are giving the vaccine and them also they don't know. So, it is a bit difficult like you are advising somebody, what am I supposed to do, like what else am I also supposed to do before going for the vaccine"* **(Female, Clinical officer, non-IDU)**
	Misinformation	*"I think the falsehood that is being spread in social media, people are having issues of infertility that have not been proven yet"* **(Female, Medical officer, non-IDU)**
Complacency	COVID-19 infection or contact history	*"Yes, I got COVID and the symptoms were not serious but now I see my colleagues getting vaccinated and some of them went up in the ward on oxygen. So, I am afraid, I don't want to get up in a ward; so, I'm banking on the immunity I acquired when I got COVID for now. yeah."* **(Male, Social worker, non-IDU)**
Calculation	Seeking information before making decisions as to vaccination	*"Yeah, so initially they were fearful of the vaccination and then they wanted to see…if we would have any adverse effects. So, after we had spent a month or two after we had been immunized, they decided to go for the vaccine"* **(Male, Nurse, non-IDU)**
Collective response	Religious beliefs and conspiracy theories	*"Some of us are totally against it based on their religion…I mean maybe some were taught about it especially the Catholics. I think the catholic church is mostly against vaccines so some of them I know up to now have never taken the vaccine but others were okay about it."* **(Male, Nurse, IDU)**

3.3. Confidence

3.3.1. Vaccine Safety Concerns

Low confidence in COVID-19 vaccine safety due to it is perceived quick development process coupled with potential and experienced side-effects by those who had been vaccinated were reported as major reasons for COVID-19 vaccine hesitancy. Health providers feared that the vaccine was not adequately studied and tested for safety before being released to the general population; hence, felt were being used as "guinea pigs" to test its safety. Additionally, health providers expressed low confidence about the vaccine's safety as vaccines against other previous viruses took a bit longer to develop and some are yet to be developed. For instance, they raised questions about the prolonged absence of a developed vaccine against HIV, despite the fact that the virus has existed for decades since its discovery.

> *"Its development was rushed. Much is not known about it in terms of its long-term effects. And there is not much information given about the vaccine, which makes people have a lot of conspiracy theories about it" (**Female, Nurse, non-IDU- 020)***

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Reported experienced side-effects and existing medical conditions were expressed by health providers as reasons for vaccine hesitancy. Health providers who already received the vaccine reported having experienced side-effects which reduced the confidence of the colleagues who were yet to as they did not want to undergo similar experiences. Some of the reported adverse effects included; localized pain at the point of administration, nausea, fever, and fatigue. Additionally, health providers reported to have refused the vaccine as they were not sure if individuals with preexisting conditions would still take it without experiencing adverse effects. For instance, they expressed concerns about what would happen if persons with asthma or varicose veins took the vaccine. Further, they expressed fears that the vaccine may cause arterial thrombosis this was due to reports that individuals who received the vaccine experienced blood clot.

> **"***It is just the body swelling and the fevers…actually it's how the body reacts with the drug. So, like I told you, you don't know how the body may react to you…so, because you find that those who have been injected, one says he/she feels dizziness, he/she feels…this, there is someone who feels okay…there is one who doesn't even come to work after taking the vaccine and I would not want to experience that"* ***(Male, clinical officer, non-IDU)***

3.3.2. Vaccine Efficacy Concerns

Health providers reported hesitancy to the COVID-19 vaccine due to low confidence in the vaccine's efficacy. They mentioned that there was lack of evidence regarding the vaccine's effectiveness against COVID-19 infection. Additionally, they highlighted that much is not known regarding the disease itself and the evolving COVID-19 variants. Further, they pointed disparities in reported vaccine protection levels across various countries that offered the vaccine.

> *"But there are fears…a lot of information we are getting is that it does not protect you from acquiring COVID-19. So, why must I get vaccinated if it is not going to protect me?"* ***(Male, Laboratory technologist, IDU)***

A health provider mentioned that he didn't take up the vaccine because his colleagues who got vaccinated still got infected and some were even admitted to the Intensive care Unit (ICU); therefore, he refused to take up the vaccine to avoid undergoing similar experience.

> **"***I have also seen my colleagues getting vaccinated and most of them…some of them got unwell, they were admitted, some of them were put on oxygen. So, I am afraid, I don't want to go for the vaccine…so, I am afraid, I don't want to get up in a ward; so, I'm banking on the immunity I acquired when I got COVID for now"* ***(Male, Laboratory technologist, IDU)***

3.3.3. Mistrust in Healthcare System

Health providers reported mistrust in institutions mandated to regulate vaccination including the government and health system in general. They were concerned about lack of proper coordination on importation and distribution of the vaccine for use. They expressed concerns about the likelihood of 'fake' COVID-19 vaccine getting in the country. Additionally, they mentioned that the COVID-19 virus might be propaganda by the government so they benefit from donations from international communities. Further, health providers expressed disbelief in the government's ability to manage any risk that would arise from receiving the vaccine.

> *"Another concern is if they are going to give us the right thing. If people are allowed to import it, are they going to import the right thing? So, it is only the government that can bring it, but you know Kenya can import anything. When other people are allowed to import (COVID-19 vaccine) it… we won't know whether it is the right one or which one…corruption at bodies mandated to look at matters' health"* ***(Male, Medical officer, non-IDU)***

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3.4. Convenience/Constraints

3.4.1. Uncertainties about Second Vaccine Dose Availability

Health providers were hesitant to receive the first dose of the COVID-19 vaccine due to fear of non-availability of the second vaccine dose. They feared that the surge in COVID-19 new infections would overwhelm the ability of the government to procure enough vaccine. They expressed concerns about what would happen if they missed their second vaccine dose or received it past the due date. Moreover, a health provider mentioned he didn't get vaccinated because he was not sure of receiving the same vaccine type for the second dose. He felt he would not get adequate protection against COVID-19 disease with a different second-dose vaccine type.

> *"I think it is different from the other staff who are not working in the COVID section. They are going for the vaccine but their worry is whether will they get the second dose; they need that assurance. If I get the first vaccine and I miss the second one what will happen? You see they need that assurance, that if I get the first dose will I get the second one*? ***(Female, Laboratory technologist, IDU)***

3.4.2. Inadequate Vaccine Knowledge

Health providers reported vaccine hesitancy due to scarce information about the vaccine development process. Some health providers felt their colleagues from other cadres were hesitant to take the vaccine as they could be aware of the vaccine development process including its ingredients. A health provider mentioned that most of her colleagues from the laboratory department were hesitant compared to other departments and mentioned that they would be privy to the vaccine's ingredients and the development process.

> *"And again, I think having that. I can't say that is the knowledge because even the doctors have more knowledge than me but to me, I can say maybe the lab people, they have the knowledge of how this vaccine is being prepared or something and that is why they are refusing* ***(Female, Social worker, IDU)***

Moreover, health providers were hesitant to take the vaccine as they were not sure of the waiting period to receive the vaccine from a previous COVID-19 infection. A health provider mentioned he was hesitant to take up the vaccine because even the health providers who administered the vaccine had less knowledge about it and would not adequately address clients' concerns.

> *"I have tried to look for information from those who are giving the vaccine and them also they don't know. So, it is a bit difficult like you are advising somebody, what am I supposed to do, like what else am I also supposed to do before going for the vaccine"* ***(Female, Clinical officer, non-IDU)***

3.4.3. Misinformation

Inconsistent information spread by various media outlets and colleagues contributed to the COVID-19 vaccine hesitancy among health providers. Health providers who had received their first vaccine dose were hesitant to go for second dose due to the discouraging sentiments by colleagues who were yet to be vaccinated. The unvaccinated colleagues told them they were likely to die within 2 years of receiving the first vaccine dose. Additionally, reports that the vaccine would cause infertility and blindness were reported as reasons for vaccine hesitancy.

> *"You know people will never stop talking of…the other day we were at our staff room taking tea and guys were saying, "all of you who have been vaccinated you only have 2 years to live." …the vaccine is not genuine, we are not being told what it does, in the future it will affect us' one said it will even cause blindness."* ***(Female, Social worker, non IDU)***

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3.5. Complacency

3.5.1. COVID-19 Infection or Contact History

Complacency played a role in vaccine hesitancy among health providers. Health providers reported that the COVID-19 vaccine was unnecessary due to previous COVID-19 infection. They mentioned that they already developed immunity against the virus from the previous infection, which made them feel protected from the virus. They added that there was no need to take the vaccine citing they preferred natural immunity over vaccination as there was scant information available about the vaccine including its potential side-effects.

> "*Yes, I got COVID and the symptoms were not serious but now I see my colleagues getting vaccinated and some of them went up in the ward on oxygen. So, I am afraid, I don't want to get up in a ward; so, I'm banking on the immunity I acquired when I got COVID for now. yeah.*" ***(Male, Social worker, non-IDU)***

3.6. Calculation

3.6.1. Seeking Information before Making Decisions as to Vaccination

A health provider mentioned that some of her colleagues were open to getting the vaccine. However, they preferred waiting for others to receive the vaccine first, intending to base their decisions on the experiences of those colleagues.

> *"Well… there are others who are telling you that they are waiting to see how people will react and see if they will get the jab, there are even others who even tell you that they will not be vaccinated, there are a lot of information out there, so there is a group who accepted the vaccine, they have a better perception of the vaccine and there is a group who is still in doubt. "(****Male, Laboratory technologist, non-IDU).***

3.7. Collective Responsibility

3.7.1. Religious Beliefs and Conspiracy Theories

Health providers were hesitant to receive the vaccine due to religious beliefs and conspiracy theories. Health providers expressed myths that the vaccine was a strategy for reducing the African population, this was because there was information spread by various media outlets that the vaccine would cause infertility.

> **"***Yes, because when you are getting the vaccine, it is said in the news that you are getting blood clots. And the conspiracy theories that Bill Gates wants to eliminate people. So, people are saying people who have been vaccinated will be infertile"* **(Male, Health records officer, IDU)**

A health provider mentioned that her colleagues were hesitant to receive the vaccine due to religious beliefs. The colleagues mentioned that the disease could be a punishment from God and only prayers would help. Additionally, some mentioned that their church was against the vaccine due to safety concerns; and the leadership had advised members against receiving it.

> *"My colleagues…some of us, we are on the same board. Some of us are totally against it based on their religion…I mean maybe some were taught about it especially the Catholics. I think the catholic church is mostly against vaccines so some of them I know up to now have never taken the vaccine but others were okay about it. So…yeah, it is a mixed feeling."* ***(Male, Nurse, IDU)***

3.8. Suggestions to Increase COVID-19 Vaccine Uptake

Health providers reported several recommendations to increase COVID-19 vaccine uptake. They suggested the need for well-planned strategies to ensure a reliable supply of the vaccine in the country and/or to produce vaccine from within the country. Additionally, they mentioned, that before vaccine is rolled out for use, the public should be sensitized about it including its availability and the benefits.

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"Another thing is that there is no knowledge, there is no known knowledge that this vaccine is good for us or it is bad for us. I think knowledge…sensitization is part of it and also, I think people need to be sensitized to increase uptake…I don't have any other thing because they were available but I think it is just sensitization" ***(Female, Laboratory technologist, non IDU)***

4. Discussion

Findings from this phenomenological qualitative study highlight reasons for health providers' hesitancy to the COVID-19 vaccine. Health providers expressed safety concerns due to the quick vaccine development process and potential and experienced side-effects. They mentioned that little was known about the vaccines' potential short-term and long-term side-effects. Government and health system mistrust, and misinformation about the vaccine contributed to the hesitancy. Health providers also highlighted the need for government to ensure well planned strategies in place to ensure reliable supply of the vaccine and to sensitize the public about any new vaccine before its rollout to increase uptake. Gaining insights about health professional perspectives regarding COVID-19 vaccine and working towards improving acceptance rate could play an important role in mitigating the consequences of the pandemic[21,22].

Safety concerns were mostly mentioned by health providers in this study as reasons for COVID-19 vaccine hesitancy. They attributed the vaccine's safety concerns to its perceived quick development compared to other vaccines and its potential side-effects from media reports. Therefore, there is need to ensure health providers vaccine's concerns and medicine adverse effects are considered before rollout programs. A review of evidence-based strategies to increase vaccination uptake highlighted that not all events occurring after vaccination can be attributed to the vaccine itself. The review emphasized the importance of ensuring access to medical advice when adverse events occur because this is crucial in building trust and addressing any concerns that may arise before it increases fear and escalates the overall negative experience[23].

Health providers in this study expressed safety concerns attributed to the perceived rush with the vaccine development citing it was not well studied before roll out; this agrees with findings of an integrative review of several cross-sectional studies conducted among health providers in America which cited hesitancy due to perceived rush of the vaccine development[24]. Similarly, a mixed method study conducted among health providers in Kenya highlighted safety concerns attributed to the pace at which the vaccine was developed compared to the time it took to develop other known vaccines[25]. Other studies also highlighted COVID-19 vaccine hesitancy among health providers due safety concerns related to the fear that the vaccine was not well studied[26,27]. Health providers were also hesitant and opted to wait for their colleagues' experiences before they could receive the first vaccine dose, this is consistent with findings from a multicenter cross-sectional survey conducted among health providers in Canada[28]. Contrary to our findings, another study conducted among community health volunteers highlighted that they were less concerned about the vaccines safety and expressed confidence in the government's ability to manage any risk associated with the vaccine[29].

Misinformation was also a key reason for vaccine hesitancy. This has also been shown in a study conducted in Kenya which demonstrated that health providers were hesitant to receive the vaccine due to misinformation about it[25]. Other studies have also demonstrated that such misinformation may range from myths to conspiracy theories. Individuals who receive inaccurate information about the vaccine from the media are more likely to report adverse effects, reinforcing others concerns. Additionally, it is established that if misinformation remains unaddressed, it can affect individuals' perceptions and decision making leading to self-perpetuating negative news[30–32]. However, providing adequate and correct information to people with high levels anxiety may not necessarily improve vaccine uptake therefore, alternative remedies need to be identified[33]. This reiterates the need to recognize that reasons for vaccine hesitancy are often complex and goes beyond the scope of information alone. Therefore, the role of health providers, religious leaders and public health officials in disseminating correct vaccine information is important but not adequate.

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Mistrust in health system, and COVID-19 infection or contact history were some reasons mentioned by health providers for vaccine hesitancy. Two other studies conducted among health providers in Ethiopia and Canada highlighted hesitancy due to trust in the immunity developed from previous COVID-infection over the vaccine[27,28]. Moreover, a study conducted among medical students in Michigan highlighted vaccine hesitancy due to mistrust in regulatory agencies, and that the vaccine development might have been politicized[34].

This study had an important strength. Importantly, the use of qualitative approaches gave a deeper understanding of health providers working either directly or indirectly with COVID-19 patient's reasons for COVID-19 vaccine hesitancy. The primary limitation of the study is the potential for social desirability bias, and given the qualitative nature of the study the results may limit the generalizability of the study findings. We did not collect data on the number of health providers who either received or did not receive the COVID-19 vaccine. Additionally, these findings only describe experiences within the Kenyan healthcare system context which may differ from experiences outside our health system environment.

5. Conclusion

Health providers are seen as trusted sources of information about vaccines. When they express hesitancy, it can erode public trust in vaccines in general, not just COVID-19 vaccines. This can lead to decreased uptake of routine vaccines (like flu shots, measles, mumps, rubella vaccines) among them, clients and the general population. Therefore, there is need to address individual, community and religious concerns regarding any new vaccine before roll-out as this is likely to increase uptake among the health providers and the general population.

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Informed consent statement: We obtained informed consent from all the subjects involved in this study.

Availability of data and materials: Individual participant data that underlie the results reported in this article, after deidentification, are available following publication and under appropriate data-sharing agreements. Data are available for researchers who provide a methodologically sound proposal.

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References

1. Singh K, Kondal D, Mohan S, Jaganathan S, Mohan D, Venkateshmurthy NS, et al. Health, Psychosocial, and Economic Impacts of the Covid-19 Pandemic on People with Chronic Conditions in India: A Mixed Methods Study. SSRN Electron J. 2020;1–15.
2. World Health Organization (WHO). . WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 11 March 2020. Geneva [Internet]. 2020 [cited 2021 Mar 13]. Available from: https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19-11-march2020

3. World Health Organization (WHO). WHO Coronavirus Disease (COVID-19) Dashboard. Geneva [Internet]. 2021 [cited 2021 Mar 13]. Available from: https://covid19.who.int/
4. World Health Organization (WHO). WHO Coronavirus Disease (COVID-19) Dashboard with Vaccination Data [Internet]. 2021. Available from: https://covid19.who.int/region/afro/country/ke
5. Wang X, Zhou Q, He Y, Liu L, Ma X, Wei X, et al. Nosocomial outbreak of COVID-19 pneumonia in Wuhan, China. Eur Respir J. 2020;55(6).
6. Alajmi J, Jeremijenko AM, Abraham JC, Alishaq M, Concepcion EG, Butt AA, et al. COVID-19 infection among healthcare workers in a national healthcare system: The Qatar experience. Int J Infect Dis. 2020;100:386–9.
7. The Centers for Disease Control and Prevention. Characteristics of Health Care Personnel with COVID-19 —. MMWR Morb Mortal Wkly Rep. 2020;69(15):477–81.
8. Ceribelli A, Motta F, De Santis M, Ansari AA, Ridgway WM, Gershwin ME, et al. Recommendations for coronavirus infection in rheumatic diseases treated with biologic therapy. J Autoimmun. 2020;109(March):102442.
9. Moncef Slaoui, Ph.D., and Matthew Hepburn MD. Developing Safe and Effective Covid Vaccines — Operation Warp Speed's Strategy and Approach. N Engl J Med. 2020;
10. Andre FE, Booy R, Bock HL, Clemens J, Datta SK, John TJ, et al. Vaccination greatly reduces disease, disability, death and inequity worldwide. Bull World Health Organ. 2008;86(2):140–6.
11. The New York Times. Coronavirus Vaccine Tracker. 2020;
12. Ministry of Health. National COVID-19 Vaccine Deployment Plan. 2021.
13. Kathleen Dooling, Nancy McClung, Mary Chamberland, Mona Marin, Megan Wallace BPB, Grace M. Lee, H. Keipp Talbot, MD6; José R. Romero, Sara E. Oliver M. The Advisory Committee on Immunization Practices' Interim Recommendation for Allocating Initial Supplies of COVID-19 Vaccine — United States. 2020.
14. Gómez-Ochoa S, Franco OH, Rojas L, Raguindin PF, Roa-Diaz ZM, Minder B, et al. COVID-19 in Healthcare Workers: A Living Systematic Review and Meta-analysis of Prevalence, Risk Factors, Clinical Characteristics, and Outcomes. Am J Epidemiol [revista en Internet] 2020 [acceso 25 de agosto de 2021]; 190(1): 161-175. 2020;
15. Nguyen LH, Drew DA, Graham MS, Joshi AD, Guo CG, Ma W, et al. Risk of COVID-19 among front-line health-care workers and the general community: a prospective cohort study. Lancet Public Heal. 2020;5(9):e475–83.
16. Omer SB, Salmon DA, Orenstein WA, Halsey N. Vaccine Refusal, Mandatory Immunization, and the Risks of Vaccine-Preventable Diseases. 2009;
17. MacDonald NE, Eskola J, Liang X, Chaudhuri M, Dube E, Gellin B, et al. Vaccine hesitancy: Definition, scope and determinants. Vaccine. 2015;33(34):4161–4.
18. Paterson P, Meurice F, Stanberry LR, Glismann S, Rosenthal SL, Larson HJ. Vaccine hesitancy and healthcare providers. Vaccine. 2016;34(52):6700–6.
19. Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): A 32-item checklist for interviews and focus groups. Int J Qual Heal Care. 2007;19(6):349–57.
20. Betsch C, Schmid P, Heinemeier D, Korn L, Holtmann C, Böhm R. Beyond confidence: Development of a measure assessing the 5C psychological antecedents of vaccination. Vol. 13, PLoS ONE. 2018. 1–32 p.
21. Sallam M. Covid-19 vaccine hesitancy worldwide: A concise systematic review of vaccine acceptance rates. Vaccines. 2021;9(2):1–15.
22. Saied SM, Saied EM, Kabbash IA, Abdo SAEF. Vaccine hesitancy: Beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. J Med Virol. 2021;93(7):4280–91.
23. Cataldi JR, Kerns ME, O'Leary ST. Evidence-based strategies to increase vaccination uptake: A review. Curr Opin Pediatr. 2020;32(1):151–9.
24. V. Caiazzo AW. Vaccine hesitancy in American healthcare workers during the COVID-19 vaccine roll out: an integrative review. Public Health. 2022;
25. Mudhune V, Ondeng'e K, Otieno F, Otieno DB, Bulinda CM, Okpe I, et al. Determinants of COVID-19 Vaccine Acceptability among Healthcare Workers in Kenya—A Mixed Methods Analysis. Vaccines. 2023;11(8):1–16.
26. Huang D, Ganti L, Graham EW, Shah D, Aleksandrovskiy I, Al-Bassam M, et al. COVID-19 Vaccine Hesitancy Among Healthcare Providers. Heal Psychol Res. 2022;10(3):1–6.
27. Shiferie F, Sada O, Fenta T, Kaba M, Fentie AM. Exploring reasons for COVID-19 vaccine hesitancy among healthcare providers in Ethiopia. Pan Afr Med J. 2021;40.
28. Dzieciolowska S, Hamel D, Gadio S, Dionne M, Gagnon D, Robitaille L, et al. Covid-19 vaccine acceptance, hesitancy, and refusal among Canadian healthcare workers: A multicenter survey. Am J Infect Control. 2021;49(9):1152–7.
29. Osur J, Muinga E, Carter J, Kuria S, Hussein S, Ireri EM. COVID-19 vaccine hesitancy: Vaccination intention and attitudes of community health volunteers in Kenya. PLOS Glob Public Heal. 2022;2(3 March):1–19.

 doi:10.20944/preprints202407.1373.v1

30. Bhopal S, Nielsen M. Vaccine hesitancy in low- And middle-income countries: Potential implications for the COVID-19 response. Arch Dis Child. 2021;106(2):113–4.
31. Kaadan MI, Abdulkarim J, Chaar M, Zayegh O, Keblawi MA. Determinants of COVID-19 vaccine acceptance in the Arab world: a cross-sectional study. Glob Heal Res Policy. 2021;6(1).
32. Faasse K, Gamble G, Cundy T, Petrie KJ. Impact of television coverage on the number and type of symptoms reported during a health scare: A retrospective pre-post observational study. BMJ Open. 2012;2(4):1–6.
33. Nyhan B, Reifler J. Does correcting myths about the flu vaccine work? An experimental evaluation of the effects of corrective information. Vaccine. 2015;33(3):459–64.
34. Lucia VC, Kelekar A, Afonso NM. COVID-19 vaccine hesitancy among medical students. J Public Heal (United Kingdom). 2021;43(3):445–9.