

Exploring the beliefs and experiences with regard to COVID-19 vaccine hesitancy and acceptance in a slum of Karachi, Pakistan

Rubina Qasim^{1,†}, Hakim Shah², Aqsa Sultan³, Muhammad Yaqoob^{1, },
Rukhsana Haroon¹, Sabuj Kanti Mistry⁴, Amy Bestman^{5, },
Mohammad Tahir Yousafzai^{6,7,†}, and Uday Narayan Yadav^{4,8,* }

¹Dow Institute of Nursing and Midwifery, Dow University of Health Sciences, Karachi, Pakistan,

²Indus College of Nursing and Midwifery, Karachi, Pakistan,

³Department of Public Health, Torrens University, Sydney, Australia,

⁴Centre for Primary Health Care and Equity, University of New South Wales, Sydney Australia,

⁵The George Institute for Global Health, Sydney, Australia,

⁶Department of Pediatrics and Child Health, Aga Khan University, Karachi, Pakistan,

⁷Kirby Institute, University of New South Wales, Sydney, Australia, and

⁸National Centre for Epidemiology and Population Health, The Australian National University, ACT, Canberra, Australia

*Corresponding author. E-mail: unyadav1@gmail.com/uday.yadav@anu.edu.au

†Equal contribution.

Summary

The COVID-19-related misinformation and vaccine hesitancy is a widespread global concern and a recognized public health problem in Pakistan. The current research sought to explore the beliefs and experiences with regard to COVID-19, including vaccine hesitancy and acceptance, in a slum of Karachi, Pakistan. This study used an interpretivist epistemological approach for data collection and employed in-depth interviews (IDIs) and focus group discussions (FGDs) to explore the themes of interest. IDIs and FGDs were conducted in the local language (Pashtu) and Urdu, using semi-structured interview guides. A hybrid thematic analysis approach (use of both inductive and deductive coding) was used to analyze the data. We identified two key themes: the first related to vaccine hesitancy and refusal and included the role of personal belief systems, vaccine mistrust and public perceptions in hesitancy; the second related to vaccine acceptance and included knowledge and awareness about the vaccine and trusted sources of information. Religious beliefs and cultural norms influenced attitudes toward COVID-19 and vaccination. This study also found that awareness about the COVID-19 vaccine in this sample was influenced by sex, educational status and socioeconomic status. Participants with good health literacy and those from healthcare backgrounds were more likely to share views that indicated vaccine acceptance. The findings of this study are being used to co-design a comprehensive intervention to dispel COVID-19 misinformation and vaccine hesitancy across a range of stakeholders such as youths, community leaders, family members, faith leaders, schools and community-based local organizations in Pakistan.

Lay Summary

This study explored the beliefs and experiences of the COVID-19 vaccine, including hesitancy and acceptance toward vaccinations, in a slum of Karachi, Pakistan. The findings of this study highlight that hesitancy was linked to personal belief systems, vaccine mistrust and public perceptions. In contrast, vaccine acceptance was linked to knowledge and awareness about the vaccine and trusted sources of information. This research identifies a clear need for co-designed health communication for vaccines to design and deliver people-centered interventions to dispel the COVID-19 misconceptions and vaccine hesitancy.

Keywords: COVID-19, misinformation, religious beliefs, vaccine mistrust, vaccine hesitancy

INTRODUCTION

Tackling the rise of the COVID-19 misconceptions and vaccine hesitancy is a great challenge for health practitioners and public health experts in the current COVID-19 pandemic (Roozenbeek and van der Linden, 2019). The rapid spread of unfiltered information through electronic and print mediums has been a longstanding challenge for community members; however, during the COVID-19 pandemic, this issue has been exacerbated (Lewandowsky *et al.*, 2017; Harapan *et al.*, 2020). While there is extensive fear and anxiety around acquiring COVID-19 and resultant health complications (Bareket-Bojmel *et al.*, 2021), community members have reported great financial concern and increased mental health issues as a result of prescribed measures to prevent the spread of COVID-19 (Dickerson *et al.*, 2022; Kumar and Nayar, 2021). The continuous COVID-19 media coverage around the globe, coupled with the spread of misinformation, has also intensified the existing fear, anxiety and stress (Naeem and Bhatti, 2020; Xiong *et al.*, 2020).

Within this global context, the government of Pakistan has undertaken country-wide initiatives for COVID-19 prevention and mass vaccinations. The National Command and Operation Center (NCOC), established by the government, managed the country's COVID-19 prevention and vaccination programs (Javed *et al.*, 2020; Waris *et al.*, 2020). However, despite these measures, the country's socio-cultural circumstances made it much more difficult to contain the spread of COVID-19. One of the driving factors that prevented progress in reducing the spread of COVID-19 is the resistance from specific communities and the uncooperative behavior of local and religious leaders in prevention efforts.

The success of vaccination programs relates to the public trust of government authorities and the health-care system/professionals. However, in Pakistan, despite the stern measures adopted by the authorities, also reinforced through media, they have been treated with apathy and unimportance (Modarres *et al.*, 2015). This public attitude across the country resulted in a rapid rise of positive COVID-19 cases during the current pandemic.

Before the COVID-19 pandemic, Pakistan had sub-standard vaccination rates with reported vaccination coverage of Bacillus Calmette Guerin (80%), polio (60%) and measles (67%) (Fadda *et al.*, 2020). These figures are still below the global childhood vaccination coverage of 86% (Francis *et al.*, 2018). The limited uptake of the vaccine in Pakistan has been linked to indistinct storylines and conspiracies; it was witnessed during the polio vaccine campaign where people were reluctant to administer the vaccine. Some healthcare workers were shot dead by Islamic militants who

believed vaccines were a strategy to sterilize the population or a cover for Western spies (Harapan *et al.*, 2020; Khan *et al.*, 2020). Adopting and propagating these beliefs can negatively influence COVID-19 prevention and vaccine uptake (Chew *et al.*, 2021). People's belief in false information about the virus, particularly, their beliefs about the origin of COVID-19, that it was human manufactured, leads to evidence that they will be less likely to accept a vaccine when it becomes widely available (Teti *et al.*, 2020). This misinformation poses a significant threat to public health during the COVID-19 pandemic (Efuntoye *et al.*, 2021). Given the rapidly evolving nature of the pandemic and vaccine development, there has been limited evidence on peoples' responses toward the COVID-19 vaccination (Perveen *et al.*, 2021). This data is critical to preventing further illness associated with the pandemic. This information is also in line with guidance from the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC), where both recommend qualitative approaches in epidemiological studies to report general public responses to the pandemics (Lockyer *et al.*, 2021). Qualitative studies are more helpful in depicting the socio-cultural and political aspects of epidemics and the subsequent development of effective interventional programs (Lockyer *et al.*, 2021). However, to date, there has been a gap in research that has examined this issue in the slum population of Pakistan. Therefore, the current study aimed to explore the beliefs and experiences with regard to COVID-19, including vaccine hesitancy and acceptance, in a slum of Karachi, Pakistan.

METHODS

Study design

This qualitative research used an interpretivist epistemological view (Scotland, 2012) and explored the drivers of the COVID-19 misinformation and vaccine hesitancy in the slum of Karachi, Pakistan. This study employed in-depth interviews (IDIs) and focus group discussions (FGDs) on understanding the comprehensive picture of the studied phenomenon. IDIs were conducted so that participants could share information freely without any fear and hesitation, and FGDs with various groups allowed exploring diverse views on a particular phenomenon through rigorous group discussion and interaction around prominent issues.

Study population

The study population for the qualitative study involved the general population and local stakeholders (community influencers) living or working in Muslimabad Colony Landhi Karachi. Local stakeholders included schoolteachers, female religious

scholars teaching in female *madrasahs* (religious schools), male religious leaders leading prayers in Mosques, informal and formal healthcare workers running first level care facilities in the given area, youth, local political members and local government officials (union council chairman), and community leaders. Both males and females, aged 18 years and above, living or working in Muslimabad colony Landhi and were able to provide written informed consent participated in the study. Participants with mental illness or terminal illness and visitors/guests in the community were excluded.

Study setting

Karachi is divided into eighteen towns, including Landhi Town, a densely populated, predominantly peri-urban town with a population of 553 665 (Statistics, 2017). There are a total of 12 union councils located in Landhi town. Most of the union councils are densely populated informal settlements composed of a Pashtu-speaking impoverished population. These informal settlements are characterized by substandard housing, squalor and a lack of essential basic health and education facilities. The male population usually works on daily wages in the nearby textile industries, and the females customarily remain at home for household chores. Muslimabad is one of the 12 union councils of Landhi with an estimated population of about 50 000 where this study was conducted.

Sampling, participant recruitment and data collection

Purposive sampling techniques were followed to recruit study participants for IDIs and FGDs. To develop rapport, trust and good working relationships with the community, all study staff were hired from the community of focus. Further, we honored the cultural norms and traditions of the community by completely segregating male and female activities and allowing only female staff to interview and approach the female stakeholders. Male participants were interviewed by two male research assistants (MA and IH) hired from the same community. All the three interviewers received 4-hour zoom training on interviewing techniques and ethics from the lead author of this article who holds rich experience in qualitative methodology and interviewing techniques. The principal investigator was female and belonged to the same Pashtu ethnicity with fluency in the local language; this was an important factor in building rapport and trust. In addition, all the stakeholders were involved from the beginning of the research project and were informed about the purpose of the study and the use of the data in the research project. A comfortable, respectful environment within the field research office had refreshments, facemasks,

sanitizers, and social distancing to further engage the community and stakeholders during FGDs.

A total of 20 IDIs, 10 males and 10 females, were conducted between 15 January and 15 February 2021, and four FGDs (two with five female participants and two with male nine (FGD#1) and seven (FGD#2) participants). Training of the field staff and piloting of the data collection tool were conducted from 11 to 14 January 2021. Female FGDs and IDIs were conducted by the female principal investigator with more than five years of research experience and male FGDs and IDIs were conducted by the male co-investigator with more than ten years of research experience. Investigators involved in data collection received half-day training on qualitative interviewing and methodology from the lead author. IDIs and FGDs were conducted in the local language (Pashtu) and Urdu for the comfort of the participants. IDIs were conducted using a semi-structured interview guide developed by the research team. This interview guide included questions on knowledge of COVID-19, vaccine hesitancy/refusal, and vaccine acceptance. The interview guide was pilot tested on three non-study participants who have characteristics consistent with the study sample. Participants suggested modifying the interview guide with regard to the sequence of questions and language expression. All the comments were addressed, and a modified guide was re-piloted where participants made no further changes. The final version of the interview schedule was used in collecting the data. The interviews began with obtaining sociodemographic details, including gender, age, educational level and occupation. The interviews were conducted in the local vernacular, Pashto, and each interview had a time length of 20–40 minutes and was recorded using voice recorder applications. Field notes were taken by another research assistant who was facilitating the qualitative interview. Data were analyzed concurrently with data collection to identify whether new themes emerged requiring changes to the interview schedule. In the current study, this was not required. Data were collected until theoretical saturation was reached and no new themes were emerging.

Before the commencement of the interviews, participants were explained the study objectives and procedures, followed by obtaining informed consent for their participation. Study participants were assured confidentiality and that none of their identifying features will be disclosed. Face masks and hand sanitizer were offered to the participants before starting the interviews. Social distancing as per the Pakistan's NCOC directives were followed. To further mitigate the risk of COVID-19 transmission, the number of participants was limited to 8–10 in each FGD. The study staff (research coordinator, PI/Co-PI and all volunteers being healthcare workers and eligible for vaccination)

Table 1: General characteristics of the participants with FGD ($n = 26$), participants with IDI ($n = 20$)

Characteristics	FGDs ($n = 26$)	IDIs ($n = 20$)
Gender		
Male	16	10
Female	10	10
Age by category (in years)		
20–29	5	4
30–39	8	5
40–49	10	9
≥ 50	3	2
Occupation		
School teachers	3	1
Housewives	2	2
Religious leaders/scholars	4	3
Health workers/local physicians/medical representative	5	4
Industrial workers	4	4
Home-based business/Self-employed	4	4
Unemployed	4	2
Religion		
Islam	26	20
Ethnicity		
Pushtu	14	10
Punjabi	5	5
Sindhi	3	3
Balochi	2	1
Urdu	2	1

were vaccinated against COVID-19 as soon as the vaccine was made available in Pakistan.

Data analysis

All the IDIs and FGDs were audio taped after informed consent and translated into the English language for data analysis. Two bilingual researchers randomly checked narratives of four IDIs, one focus-group discussion and field note to ensure reliability. Study team members (first, third and last author) conducted regular discussions during the data collection and analysis stage to validate that collected information and ensure participant meaning was captured. Minor adjustments in the English translation were made to the vocabulary that caused discrepancies and misapprehension. Two independent researchers discussed all the adjustments made to ensure that adjustments were valid. This study used a hybrid thematic analysis approach following six flexible steps suggested by Braun and Clarke's (Braun and Clarke, 2006) approach to qualitative data analysis. We integrated deductive and inductive methods in the development and interpretation of codes and

themes and was an iterative process (Fereday and Muir-Cochrane, 2006). This integrated approach helped us to immerse into data, think deeply, reflect and develop a balanced and comprehensive coherent analytic story required to illuminate the studied phenomenon (Swain, 2018). The two investigators reviewed the transcripts and developed and arranged the codes under particular sub-themes and themes until a consensus was reached. In this process, some of the verbatims were edited to make the meaning clearer keeping the meaning same.

RESULTS

The details of the participants' characteristics are presented in Table 1. Out of 46 participants, 26 were males and the remaining females, and the majority were from *Pushtoon* ethnic backgrounds. Male participants included three religious' scholars, four schoolteachers, one homeopathic doctor, one medical representative, four young boys (under the age of 20 years), four aged retired/at-home males (>60 years), four health-care workers, one salesman, two textile workers and

two self-employed. Female participants comprised five housewives, three healthcare workers, two polio-vaccine workers, one tailor, two religious scholars, three schoolteachers, two young girls and two older females (>60 years). The two main qualitative themes related to vaccine hesitancy and refusal, and vaccine acceptance evolved from the thematic analysis and were validated in a co-design workshop with various stakeholders. The themes identified in the analysis have been represented in Figure 1.

Thematic area 1: Vaccine hesitancy and refusal

The first theme to emerge explicitly related to vaccine hesitancy and refusal. Not limited to the COVID-19 vaccine, reluctance to vaccine administration is a widespread phenomenon in Pakistan. Participants referred to their overall attitudes toward vaccinations, and often when these attitudes conflicted with religious or cultural beliefs. We term this reluctance as “vaccine hesitancy” in the present study. More than half of the participants indicated that they were hesitant.

Personal belief systems

Religious and cultural beliefs

Personal belief systems were a key theme relating to vaccine hesitancy. One area, in particular, was tied to participants’ religious beliefs and cultural norms. The majority of religious leaders, especially of Pashtun ethnicity, show reluctance and resistance against vaccination. Some participants explained that getting vaccinated was prohibited in their religion. Most of these participants reported low-health literacy

levels and were females from low-socioeconomic backgrounds. The majority of the participants were skeptical about which sources of information could be trusted, and some had stern beliefs on faith/traditional healing methods. One participant from the FGD explained,

“Trust should only be on Allah; all the doctors are fake.” [35 years/Female/Housewife]

Nearly one-third of the participants believed that vaccinating healthy individuals was an act of cruelty, comparing COVID-19 vaccinations to being treated like animals (since vaccines are given to dogs):

“I will not vaccinate myself because these vaccinations are also given to dogs; it’s not trustable” [60 years/Female]

Internal beliefs without reason

Some participants from the FGDs showed a nonflexible and stringent attitude toward the COVID-19 vaccine with no definite reason to justify their hesitancy; this suggests a lack of knowledge about COVID-19 and the vaccine. One male participant said:

“I don’t know much about this disease and will not believe that this [COVID_19 Vaccine] will cure this disease. COVID-19 is a conspiracy theory created by the westerners.” [32 years/Male/Uneducated/]

Some female participants of FGD seemed to hold dismissive opinions about the global pandemic.

“I will never go for corona vaccine, even if I knew that tomorrow I will die and the only way to

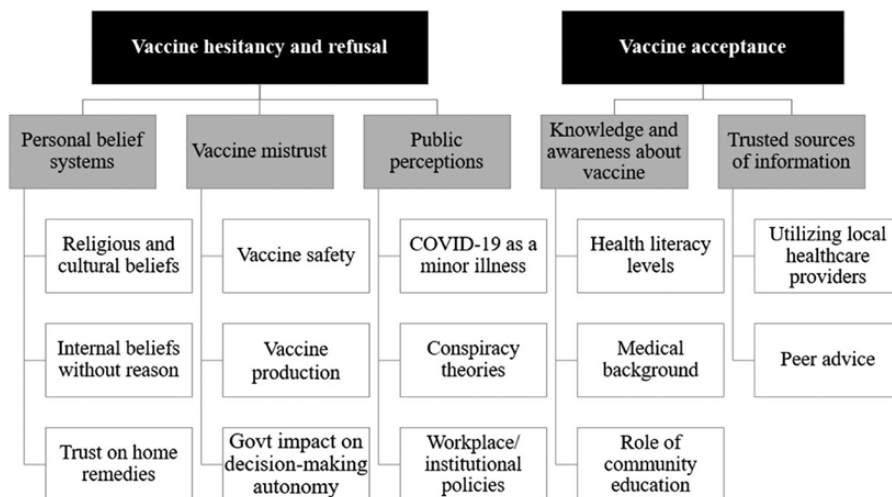


Fig. 1: Qualitative themes.

protect my life is corona vaccine.” [39 years/Female/ Housewife]

Trust in home remedies

For some participants, personal solid beliefs toward home remedies were barriers to getting vaccinated against COVID-19. People believed that using organic, chemical-free, whole food products would help prevent COVID-19 and its health impacts. For instance, the belief using the saline solution for clearing nasal passages is more beneficial than a vaccine. One participant from IDIs said,

“I believe in taking ginger tea to prevent cold and flu, using hot water, adopting preventive measures and treatment, and abstinence from the vaccine can help defeat Covid-19.” [46 years/male/illiterate]

Vaccine mistrust

Vaccine safety

Participants described that a large amount of conflicting and confusing information during the pandemic had left them feeling nervous and perplexed concerning the transmission of COVID-19 and the vaccine. One of the emerging themes for vaccine hesitancy was a concern over potentially unforeseen, longer-term side effects. The majority of males and females from both IDIs and FGDs expressed their consideration of the negative consequences of the forthcoming COVID-19 vaccine. They shared their own experiences and mainstream narratives that highlighted the negative aspects of vaccinations. For example:

“I’m not in favour of vaccination at all, because I lost my only son because of [their response to the vaccine]” [40 years/male/naswar (Tobacco) seller/illiterate]

“When the side effects of vaccination are too much, it may deteriorate person health’s state, and he/she might die, then what’s the benefit of such vaccination.” [35 years/male/homeopathic doctor]

A few participants from IDIs and FGDs held strong beliefs that the vaccine was not the cure for the disease, but the culprit behind fatalities during pandemics. They believed that no competent vaccine could be prepared in such a short time period. One participant said:

“The world is focusing on producing vaccine [for COVID-19], but until now, no appropriate vaccine has been created. Indian Government said they had created a vaccine, but many people died; likewise, people died due to vaccination in America. Presently right vaccine is not available.” [35 years/male/homeopathic doctor]

One participant shared a local story that community members had been injected with ‘poisonous substances’ (through the vaccine) which resulted in their death:

“We hear those patients are taken to hospital are injected to death.” [28 years/male/illiterate]

Vaccine production

Some participants raised concerns about potential quality control measures and the production of the vaccine. This included the trustworthiness of vaccine providers. Some participants from the IDIs expressed their confusion and fear about severe side effects. Some participants who indicated they would get vaccinated believed that ‘fake news’ spreading in social media and communities impedes their decision-making process on receiving the vaccination. One participant said:

“We [community] are overwhelmed by the false information, and it’s hard to educate people who have mistrust towards a vaccine. I would love to go for the vaccine, but I’m afraid society will boycott me if we go for it [vaccine].” [39 years/female/educated]

Some healthcare providers (HCPs) said they had heard factually incorrect news on social media on vaccine production, which contributed to vaccine mistrust. Some participants indicated a future intention to be vaccinated, however, they were waiting to obtain further (trustworthy) evidence of vaccine safety. For example, one doctor in the sample expressed hesitancy, saying:

“I will vaccinate myself and my family members too, but after testing from a certified laboratory, I might know the facts; otherwise, not.” [42 years/male/physician]

Participants described that misinformation on vaccine production was spread from online portals, making it hard for them to decide with regard to the vaccine uptake. Some participants asserted that they would get vaccinated in the future if they received correct information from the healthcare workers. All the healthcare workers from IDIs were, in principle, accepting the COVID-19 vaccination; however, highlighted concerns about the safety of current vaccines. One participant was found waiting for further evidence of safety:

“I will go for it [Covid-19 vaccination] if a reputable authority administers it. I believe in qualified, experienced doctors.” [45 years/male/healthcare worker]

Some participants described concerns about the country of origin of vaccines (in Pakistan, vaccines were made by Chinese companies). Few participants shared stories that they don't believe in Chinese products as they are unreliable. Other participants blamed China for the emergence of the virus and so were hesitant to trust vaccines manufactured in China:

"Pakistan has brought vaccines from China, which will be given to persons from 18 to 60 years. I am not sure what will happen to those who receive this vaccine." [35 years/male/healthcare worker]

Government impact on decision-making autonomy

For a small number of participants, specifically non-working female participants, privacy concerns were raised regarding the COVID-19 vaccine. This included concerns about providing unnecessary personal information. Additionally, participants felt coerced by health officials convincing them to opt for COVID-19 vaccination. They believed that the government was trying to force vaccination on them and take their rights away. They think that this forceful imposition of vaccination is a despicable act. One female participant from IDI said:

"I will never opt for it; I would prefer to die. As I said earlier, things are pre-planned, and if the vaccine is there, none of the government officials can invade my autonomy by forcing me for such vaccination." [45 years/female/housewife]

Public perceptions

Considering COVID-19 minor illness

A few study participants from IDIs and FGDs believed that Covid-19 is a minor illness like the common cold or flu that goes away on its own and does not warrant a vaccine. This belief was particularly held by young participants, who said that health officials are creating unnecessary panic among people and their health is deteriorating due to this stress. It was found that young people believe that their immune defense systems are healthy enough to fight the SARS-COV2 virus effectively, and there is a strong sense of denial among them.

"I don't think so. They [people] are saying older adults or those with health problems or children should be vaccinated. We don't need it [vaccine] as we are fit and fine and have no health problems, and none of our friends are infected. Even though we are socialized and have gatherings every evening." [28 years/male/illiterate]

Conspiracy theories

In Pakistan, the prime barrier to alleviating preventable disease is vaccine hesitancy. For example, the inability

to completely eradicate the poliovirus is predominantly attributed to misleading facts related to the vaccination. Media plays a substantial role in spreading negative stories and people's experiences. This plethora of anti-vaccine social media content sparked the rumour, and many participants believed that the agenda behind vaccine development is to harm particular ethnic groups and portrayed the vaccine as a "Western controversy."

"It's [Vaccination] Israel conspiracy and game to force Pakistan to recognize Israel." [72 years/male/primary education]

Another participant from an FGD said:

"I am regularly using WhatsApp where I get a lot of information from my friends. A person in the video has explained how America and its alliances are playing games to shake the world. And the governments of poor countries, like us, are under their strict control to complete their goals. I wonder why our religious leaders are silent, and they are doing nothing. It seems that they are also involved in this global hoax." [40 years/male/illiterate]

Workplace/institutional policies

At the time of this survey, none of the participants from FGDs and IDI reported that their employers mandated vaccination. Job insecurity and fear of unemployment were not influencing factor for vaccine acceptance.

Thematic area 2: Vaccine acceptance

The second theme to emerge was vaccine acceptance, linked to knowledge and awareness about vaccines and trusted sources of information. This theme encapsulated the importance of health literacy, community education and trusted sources of information in creating a conducive environment for vaccine acceptance. Moreover, the results showed that the flow of correct information on a vaccine from individuals with medical backgrounds or educated peers was driving for creating positive attitudes toward the COVID-19 vaccine.

Knowledge and awareness about vaccine

Health literacy levels

One-quarter of the participants involved in the study generally understood the rationale behind vaccination. This level of awareness may be attributed to government efforts related to polio vaccination programs. When looking specifically to the COVID-19 vaccination awareness, factors such as gender, health literacy/educational status and socioeconomic status influenced attitudes. Participants who indicated a willingness to have or had received the COVID-19 vaccination demonstrated good health literacy or worked in a health care facility. For example:

“Everyone has their own opinion and theory [on vaccination], and one of the biggest problems is ignorance. So, educated person must raise awareness.” [27 years/male/medical representative]

Medical background

Participants with medical-related training had the highest levels of trust in the vaccine. Interestingly irrespective of age and gender, healthcare workers expressed their confidence toward the effectiveness and safety of vaccines and demonstrated proficient knowledge about COVID-19, a positive attitude, and shared their trust in COVID-19 vaccine. One participant from IDI reflected positive attitude as:

“I trust in the vaccine, and I’ll certainly motivate others for the vaccination. I know it’s challenging in Pakistan, but I will try my best” [40 years/male/general physician]

All the interviewed healthcare workers showed great interest in the vaccination program. These HCPs also highlighted that vaccine misconceptions need to be addressed before launching the COVID-19 vaccination program. One female HCP expressed:

“When vaccine will be available, the process of vaccination should be first administered to health care workers. This will help in minimizing the vaccine misconceptions.” [35 years/female/healthcare worker]

Role of community education

Participants indicated that education and counseling on the COVID-19 vaccine would aid in community vaccine acceptance. All HCPs emphasized that poor-health literacy, reluctance to seek medical advice among people, and lack of communication channels were big hurdles in gaining the public’s confidence in the COVID-19 vaccine. Some participants described that clear and consistent communication between healthcare professionals and the public has helped in improving public compliance with previous vaccines and could play a role in the current pandemic:

“Initially we were reluctant for polio vaccinations, but when polio teams visited us and properly educated us regarding the purpose of this vaccination, then we adopted and given polio team space in our home to carry out their activities.” [22 years/Female]

HCPs also suggested addressing vaccine and COVID-19 misconceptions through “vaccine literacy campaigns”, emphasizing women education and providing

succinct information in plain language for uneducated/illiterate people. One health care worker expressed:

“We should provide some information resources to educate people about the benefits of vaccines.” [40 years/Female/healthcare worker]

Trusted sources of information

Utilizing local healthcare providers

The HCPs highlighted their existing relationships with communities through other vaccination rollouts. A female polio worker shared her experience regarding vaccination counselling and the importance of communication in convincing people to get vaccinated:

“When I’m administering polio drops, I tell the parents they should place their trust in me; we should provide all the relevant information beforehand.” [40 years/female/polio worker]

An interesting attitude was found while interviewing a male participant who uttered that respecting and trusting local female healthcare workers is a part of their culture. Few participants from the FGDs also expressed the need for involvement of female healthcare workers from the same community to impart health education and vaccine awareness in a culturally sensitive manner. One male participant said:

“I never had trust in vaccines during the polio outbreak, but later one female worker educated and motivated me by providing correct information on the importance of the vaccine. I trusted her because she was from the same community. It’s easy to believe in people from the same community because if they lie, we can knock on their door easily”. [43 years/male/uneducated]

One health care said:

“Informal healthcare workers (Quacks) provide most of the health services in slums and are trusted by the community. They [Informal healthcare workers (Quacks)] are responsible for spreading hoax without having correct information.” [40 years/female/polio worker]

Peer advice

Respecting and following the elder’s advice is rooted in the South Asian culture. Many participants of this study highlighted that consideration of advice from elders, friends and family (particularly males) could convince participants to get vaccinated. Most of the participants were aware of COVID-19 vaccine availability, but none were ready to go for vaccination. Some participants including some educated person said that they are interested in taking the COVID-19 vaccine but

will decide based on the decision from the head of the family.

One schoolteacher said:

“I’m in support of (COVID-19) vaccination and will also vaccinate my children, wife, and other family members once it’s available. This decision comes from our family elders or head of the family”. [34 years/female/school teacher]

DISCUSSION

This study was designed to qualitatively explore the beliefs and experiences with regard to the COVID-19 vaccine hesitancy and acceptance in a slum of Karachi, Pakistan. In this study, we found that participants had a range of misconceptions regarding COVID-19 and vaccination amplified by the mounted exposure to misinformation via social media platforms. We found that participants with low literacy were more hesitant about the COVID-19 vaccine.

Vaccine hesitancy has been a major and longstanding challenge in Pakistan (Khan *et al.*, 2020). Vaccine hesitancy stems from historical social and structural issues related to the roll-out of the poliovirus vaccination program. This includes a lack of administrative capacity to implement vaccination programs (Jin *et al.*, 2021). However, despite historical vaccine hesitancy in the country, there is an opportunity to use the lessons learned around successful roll-out in the current pandemic. Identifying and addressing the people’s health beliefs that prevent their uptake of the COVID-19 vaccine is a critical step in the containment of the pandemic. Programs should address community concerns on COVID-19 vaccine safety and efficacy, a finding supported by other global studies on vaccine hesitancy (Dror *et al.*, 2020; Efuntoye *et al.*, 2021; Machingaidze and Wiysonge, 2021; Piltch-Loeb *et al.*, 2021; Yadav *et al.*, 2021). This current research shows that using trusted health professionals from the community itself to deliver vaccinations and health messaging may overcome community mistrust of vaccines. Similar to other studies (Robichaud *et al.*, 2012), our study found that healthcare professionals such as doctors, nurses, and other healthcare workers had good knowledge and positive attitudes toward the COVID-19 vaccine. This must be supported by enhanced competency and reliability of the institutions involved in vaccination programs (Pilichowski *et al.*, 2021).

However, a significant challenge for vaccination in Pakistan is the conspiracy theories propagated mainly by social media and community discourses. Concerningly, media, such as newspapers and televisions, not only disseminate valuable information regarding preventive measures but also provide a

platform for pro- and anti-vaccine content to be broadcast (Ullah *et al.*, 2021), playing a critical role in influencing community perceptions of vaccinations (Callender, 2016; Puri *et al.*, 2020). To overcome this barrier, we recommend that media content moderation is required fostering partnerships between social media platforms and health institutions to promote vaccine awareness. Moreover, our study results revealed that high-education levels and being employed in a health-care setting (hospital and clinics) were connected to vaccine acceptance, while study participants who had low-education status and belonged to low-socioeconomic status lacked potential knowledge about the COVID-19 vaccine and showed reluctance to get vaccinated. Health practitioners and policymakers should work to educate people in the media on the health benefits of vaccination. Additionally, media person should be trained to develop health messaging that is suitable for those with low-health literacy and literacy levels, such as through imagery and emotive language, to facilitate health information communication.

We also found that females were more reluctant for vaccination, contrasting with findings from studies conducted in developed countries (Lazarus *et al.*, 2020). The plausible reason could be low-health literacy, unemployment, dependence on male family members for the decision making process, questionable vaccine safety, and religious inhibitions (Agha, 1999). This suggests the need for culturally acceptable women-centered intervention that can dispel misconceptions and empower them to make decision on for the well-being of themselves and their family members.

The COVID-19 vaccine hesitancy seems to be deep-rooted and amplified by false information available on social media and religious beliefs in slums setting of Pakistan. In line with our findings, evidence showed that uneducated or less educated people were strongly attached to the Islamic beliefs and believed vaccine was a western intrigue to drift them away from their religious path (Grabenstein, 2013; Pelčić *et al.*, 2016). There is no one-size-fits-all solution; to address this identified problem, we must design people-centered solution by focusing on the needs and concerns of individuals, families, and communities; that can protect them from severe illness and COVID-19 mortality. Current study findings provide insight to the policymakers and researchers to understand why rumors and misinformation have taken hold during pandemic in Pakistan and will help them design people-centered solutions through community engagement, essentially required to dispel misinformation with evidence-based information.

It is evident from the previous literature that medical misinformation spreads swiftly during the period of stress and anxiety (Machingaidze and Wiysonge, 2021;

Yadav *et al.*, 2021); they render people more vulnerable to accepting implausible information (Qc, 2020). Recently, the rapid advancement of social media has exponentially enhanced the swiftness of rumors. The participants in this study clearly expressed their bewildered behavior in accepting the COVID-19 vaccine; this pattern of behavior was particularly more apparent within marginalized groups, who had a lack of awareness and had a significant predisposition to accept false information. Participants belonging to the medical profession utilized the opportunity to provide appropriate information to people and diminish the rising trend of false information. Notably, religious groups' misinterpretation of the COVID-19 vaccines is recognized concern, and the questionable religious interpretation is a threat to human survival (Pelčić *et al.*, 2016; Yadav *et al.*, 2021). Therefore, it is crucial that religious leaders or individuals who are strongly connected to any faith should understand the value of evidence and need to bring theological perspective to support humanity rather than using religion as an excuse for vaccination refusal. Moreover, in slums, informal healthcare workers (Quacks) usually provide health services and are responsible for misinterpretation of the information. Therefore, there is a need of necessary training and education for informal health workers on importance of vaccines and impact of misconceptions on COVID. They are respected and trusted by the community. To sustain or restore confidence in the COVID-19 vaccine, a holistic citizen's specific approach is needed that can be tailored to different levels of society (e.g., individual, family, community), including informal health workers, religious, and political leaders.

Limitations and strengths

Strengths of the current study include that this is one of the first studies conducted in Karachi slums with participants belonging to diverse socio-demographic and ethnic backgrounds to provide insights into unexplored community misinformation toward COVID-19 and its vaccine. Another strength of the study is the generation of triangulated findings from IDI and FGDs that captured the collective understanding of wider stakeholders like health care providers, religious groups, schoolteachers, and females toward COVID-19 misinformation and vaccine hesitancy. Despite the fact that this study provides comprehensive insights regarding acceptance and reluctance to COVID-19 vaccine in Pakistan, the findings cannot be generalized as it was a qualitative study and was conducted in one slum area of Karachi, Pakistan.

CONCLUSION

This study explored various underlying factors related to COVID-19 beliefs, prevailing misinformation on COVID-19, and attitudes toward the COVID-19

vaccine. Our study's findings highlight the need for comprehensive intervention that could dispel COVID-19 misinformation and vaccine hesitancy among the slum population of Karachi, Pakistan. Also, our findings suggest the need to engage wider stakeholders such as youths, community leaders, family members, faith leaders, schools, and community based local organizations in the design and delivery of people-centered intervention to dispel COVID-19 misinformation and vaccine hesitancy.

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Conflict of Interest Statement

None.

Authors' Contribution

RQ, MTY, and UNY conceived the study, secured funding, and designed tools. RQ, HS, MY, and MTY collected the data. AS, RQ, AB and UNY analyzed the data. RQ, AS, AB, SKM, MY, MTY and UNY prepared the first draft of the manuscript. AB and UNY thoroughly contributed to scientific content, reviewing and editing. All the authors approved the final version.

Ethics Approval

This study protocol was approved by the Institutional Review Board (IRB), Dow University of Health Sciences, Karachi (Reference No: IRB-1841/DUHS/Approval/2020/), and approval was also obtained from Chairman, Union Council Muslimabad prior to commencing field data collection. Written assent consents were obtained from all the study participants.

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