Determinants of COVID-19 Vaccine Acceptance in Six Lower- and Middle-Income Countries

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Abstract

Background:

While a vaccine is the only clinical preventive measure to control the infection and mortality caused by SARS-CoV-2 (COVID-19), delayed acceptance or refusal of COVID-19 vaccines may increase and prolong the threat to global public health and the economy. Identifying behavioural determinants is considered a critical step in explaining and addressing the barriers of vaccine refusal, but there is a lack of evidence around COVID-19 vaccine refusal and delay from a behavioural perspective. This study aims to identify the behavioural determinants of COVID-19 vaccine acceptance and provide recommendations to design actionable interventions to increase the uptake of the COVID-19 vaccine in six lower-and-middle income countries.

Methods:

Taking into consideration the Health Belief Model (HBM), Theory of Reasoned Action (TRA), and other behavioural models, a Barrier Analysis (BA) approach was employed to examine twelve potential behavioural determinants of vaccine acceptance in Bangladesh, India, Myanmar, Kenya, the Democratic Republic of Congo, and Tanzania. In all six countries, at least 45 interviews with those who intended to take the vaccine ("Acceptors") and another 45 or more interviews with those who did not ("Non-Acceptors") were conducted, totalling 542 interviews. Data analysis was performed to find statistically significant (a p-value of less than 0.05) differences between Acceptors and Non-acceptors and to identify which beliefs were most highly associated with acceptance and non-acceptance of the behaviour based on estimated relative risk (ERR).

Results:

The analysis showed that perceived social norms, perceived positive and negative consequences, perceived risk of getting COVID-19, perceived severity of COVID-19, trust in COVID-19 vaccines, perceived safety of COVID-19 vaccines, and expected access to COVID-19 vaccines had the highest association with COVID-19 vaccine acceptance in Bangladesh, Kenya, Tanzania, and DRC. Additional behavioural determinants found to be significant in both Myanmar and India were perceived self-efficacy, trust in COVID-19 information provided by leaders, perceived divine will, and perceived action efficacy of the COVID-19 vaccines. The study also identified important perceptions and beliefs around COVID-19 and its severity, advantages and disadvantages of being vaccinated, and action efficacy of the vaccine to control the spread of the virus.

Conclusion:

Many of the determinants found to be significant and their level of significance varied from country to country. National and local plans should include messages and activities that address the behavioural determinants found in this study in order to significantly increase the uptake of COVID-19 vaccine across these countries.

Introduction

As of 27 February, over 113 million people have become infected by the COVID-19 virus, and over 2.5 million people have died globally (1). The health, economic, and social disruption of the pandemic has affected millions of people. Governments, academia, researchers, and public and private institutions have been promoting preventive measures and seeking therapeutic solutions to stop the virus from spreading further.

As the pandemic is expected to continue to impose enormous burdens of morbidity and mortality, and to severely disrupt societies and economies, the introduction of effective COVID-19 vaccines is the only clinical preventive measure. While these vaccines have been a positive development in curbing the pandemic's effect, anecdotal reports and some studies have shown that there is hesitancy to take the vaccine among many populations. The ability of COVID-19 vaccines to stop the spread of the virus will depend on both the efficacy of the vaccines (with three now showing 70%, 90% and 95% efficacy) and the degree to which people are willing to get one of these vaccines – vaccine acceptance. In order to reach the expected threshold for herd immunity (about 67%), approximately 96%, 74%, and 71% of people would have to be immunized with all doses of one of the three vaccines (respectively). It is essential, therefore, to understand the behavioural determinants of COVID-19 vaccine acceptance. It will be important – in each country and context – to identify barriers that will hinder people from seeking immunization and enablers that make people more likely to seek out COVID-19 immunization. Developing a viable and effective vaccination strategy begins by understanding the barriers and enablers of vaccine acceptance.

Vaccine hesitancy or refusal of COVID-19 vaccines is a growing concern worldwide. The World Health Organization (WHO) identified vaccine hesitancy as one of the top ten global health threats in 2019 (2). Studies into vaccine hesitancy have shown that a number of factors that influence it, and that it varies across countries. In one multi-country survey, it was found that only 71.5% of participants reported that they would be very or somewhat likely to take a COVID-19 vaccine (3). In an Ipsos survey of more than 18,000 adults from 15 countries conducted in partnership with the World Economic Forum, 73% of respondents said that they would plan to get a vaccine for COVID-19 if it were available. An earlier global survey on acceptance of vaccines (in general, not for COVID-19) conducted in 2016 found widely differing rates by country (4).

A UK national representative survey (December 12-18, 2020) from more than 1,400 adults and five focus groups revealed that trust was a key predictor of vaccine hesitancy. Distrust of vaccines and the government may increase the likelihood of vaccine hesitancy, while trust in health institutions and experts may decrease the likelihood of hesitancy. Low perceived personal threat, fears around accelerated vaccine development, concerns about side effects, misunderstandings regarding herd immunity, and beliefs that the virus is manmade or will be used for population control all may contribute to the likelihood of vaccine hesitancy (5). A rapid systematic review of 23 academic studies and 103 additional syndicated surveys around COVID-19 vaccine hesitancy in the 31 countries found that perceived risk, concerns over vaccine safety and effectiveness, doctors' recommendations, and inoculation history were common factors (6). This same review also showed that unique COVID-19 factors included doubts around the expedited development/approval process, political party orientation, and perceived political interference. Vaccine hesitancy was also found to be growing between March and November 2020 (7), but improvements in vaccine acceptance have been noted in some countries since November (8).

A growing number of studies identify demographic, socioeconomic, and behavioural factors that are linked with levels of vaccine acceptance (3,9,10,15–17). These factors include age and marital status (11,12), level of

education and ethnic origin (10,12,13), previous vaccination with an influenza vaccine (10,14), and gender (11).

The SAGE Working Group on Vaccine Hesitancy has described acceptance of vaccination as an outcome behaviour resulting from a complex decision-making process that can be potentially influenced by a wide range of contextual, socio-cultural, health system and historic factors, influences arising from personal perception of the vaccine (including risk/benefit), influences of the social/peer environment, and vaccine or vaccination specific issues (18). Similarly, in a report on acceptance and uptake of COVID-19 vaccines, the Technical Advisory Group on Behavioural Insights and Sciences for Health of WHO has identified a number of drivers including enabling environment, social influences and motivation (19). In terms of environmental factors, the advisory group mentions vaccination location, cost, timing, the quality of the experience of being vaccinated (e.g. how people are treated), and information and clarity of information provided on vaccination benefits. In terms of social influence, they mention beliefs about what others in one's social group do, or what they approve and disapprove of (i.e. "social norms"). Under motivational determinants, perceived risk, perceived severity of infection, confidence in vaccines, and values and emotion are included. In addition, similar behavioural attributes of vaccine hesitancy have been described in the scientific literature (15,18,20–25).

Behavioural studies on other vaccines have showed that the decision to vaccinate is often based on factors that are the focus on the Health Belief Model (HBM) – such as perceived benefits, perceived effectiveness of the vaccine (also known as perceived action efficacy), perceived vaccine side-effects and reduced perceived risk of infection by COVID-19 (26). Systematic reviews on behavioural determinants have shown that assessing determinants that are included in the HBM revealed significant determinants associated with the acceptance of Human Papillomavirus (HPV) (16) and influenza vaccination uptake (27). The HBM has also been found to be effective in predicting intention to vaccinate against influenza among health care workers in Jordan (28). Similarly, a study using Theory of Planned Behaviour (TPB, which was developed from the Theory of Reasoned Action) showed that vaccine intentions among college students were determined by subjective norms, attitudes, and perceived behavioural control regarding vaccinations (29). In a comparative study of TPB and TRA, it was found that attitudes and perceptions of social support were determinants for HPV vaccination uptake (17), as well. Moreover, trust, misconceptions, misinformation, and lack of knowledge among the community on vaccine-preventable diseases are considered influential determinants of the lower level of acceptance (3,6,9,10,15). These factors have influenced vaccine uptake during previous pandemics and outbreaks caused by H1N1, MERS, SARS, and Ebola virus (3,6,9,10).

A meta-analysis demonstrated that the use of social psychological health behavioural change models (e.g. the Health Belief Model, Theory of Planned Behaviour) could be useful in identifying the influencing determinants of vaccine acceptance (15). Furthermore, vaccine hesitancy and acceptance are complex in nature, and the vaccine decision can vary according to context, time and place (30), so many earlier and often global studies that focused on demographic determinants may have limited value in understanding the determinants of COVID-19 vaccine acceptance in a given country, time, and culture. Understanding how different behavioural attributes affect individual preferences about vaccination at as granular level as possible can help inform public health authorities about the actionable activities and messages that will be necessary to achieve broader community uptake of COVID-19 vaccines. Therefore, the primary objective of this study was to identify the behavioural determinants of COVID-19 vaccines in Bangladesh, DRC, India, Kenya, Myanmar, and Tanzania for use by different stakeholders.

Background Of The Study

WV conducted a Barrier Analysis (BA) study in six countries (Bangladesh, India, Myanmar, Kenya, Tanzania and DRC) from 7-16 December 2020 in order to identify behavioural determinants of COVID-19 vaccine acceptance. The study enrolled 452 adults (227 “Acceptors” [Doers] and 225 “Non-acceptors” [Non-doers]) above 18 years of age.

Bangladesh reported its first clinically-confirmed COVID-19 case on March 8, 2020. As of 27 February 2021, Bangladesh reported 545,831 COVID-19 cases with 8,400 deaths (31)(32). A study on acceptance of COVID-19 vaccines in Bangladesh in January 2021 surveyed 3,560 randomly-selected people above 18 years of age. This study found that only 32 percent of respondents were interested in taking a COVID-19 vaccine immediately, highlighting doubt about the vaccine’s effectiveness and quality as well as fear of side effects. According to the study, 22 percent wanted to get the vaccine after a few weeks, 27 percent after a few months, and 3 percent after one year, while 16 percent did not want the vaccine at all (33). Another survey conducted during December 2020 and January 2021 reported that 81% of people living in urban (metropolitan, district and municipal) areas, 64% of those in rural areas, and 53% of slum dwellers (34) would seek vaccination when a COVID-19 vaccine was available to them. WV conducted a BA study in a rural area of Bangladesh – Thakurgaon District in the Rangpur Division – interviewing 45 vaccine acceptors (“Doers”) and 45 vaccine non-acceptors.

India had its first case of COVID-19 on 27 January 2020, and started the most extensive COVID-19 vaccine program on January 16, 2021, targeting 30 million people. India has now recorded more than 11 million COVID-19 cases, the second-highest in the world, and 151,000 deaths. It has been observed that there is vaccine hesitancy over the safety and efficacy of the in-house CVAXIN. A survey conducted by LocalCircles in January 2021 concluded that Indians’ COVID-19 vaccine hesitancy remains unchanged in November and December 2020, with only 41% maintaining that they plan to get the vaccine (35). In India, WV conducted a BA study interviewing 47 Acceptors and 45 Non-acceptors from selected communities in Andhra Pradesh, Madhya Pradesh and Assam states.

Myanmar: Myanmar has 141,875 confirmed COVID-19 cases with 3,199 deaths as of 27 February 2021. Myanmar launched a nationwide coronavirus vaccination drive beginning 26 January 2021, inoculating health-care personnel and volunteers who are serving on the COVID-19 frontlines. Myanmar plans to vaccinate 40 percent of its population against COVID-19 by the end of 2021. The remaining adults are expected to be vaccinated during the 2022-23 fiscal year. Data from Johns Hopkins Center for Communications Programs estimates that intent to vaccinate is currently 80.1% in Myanmar (36). In Myanmar, WV conducted a BA study interviewing 45 Acceptors and 45 Non-acceptors from selected communities in Thabuang Township of Ayarwaddy Region.

Kenya: As of 27 February 2021, there have been 105,467 confirmed COVID-19 cases and 1,853 deaths registered in Kenya/ The Kenyan Ministry of Health has ordered 24 million doses of the COVID-19 vaccine developed by AstraZeneca and Oxford University and expects to receive the doses in mid-February, and the country aims to vaccinate 16 million people against COVID-19 by June 2022. In a WV study in a rural district of Kenya, only 18.9% percent of respondents said that they were “extremely likely” and 21.1% said that they were “somewhat likely” to get a COVID-19 vaccine when it was available to them free of cost. Sixty percent of respondents said that they were “somewhat unlikely” (26.5%), were “extremely likely” (17%) or “did not know” (16.5%) if they

would get a COVID-19 vaccine (World Vision Digital Social & Behavioural Change Study, November 2020: Personal Communication). In Kenya, WV conducted a BA study interviewing 45 Acceptors and 45 Non-acceptors from selected communities in Elgeyo Marakwet County.

Tanzania: Although Tanzania recorded its first coronavirus case on 16 March 2019, the official report from Tanzania, showed only 509 confirmed COVID-19 cases and 21 deaths due to COVID-19 by the beginning of February 2021. The government stopped releasing data on the number on COVID-19 cases and deaths since April 2019. However, many believe that the number of COVID-19 cases and deaths may be far more widespread than authorities are reporting. Although large public gatherings are banned, and schools and universities are closed, masks, social distancing, and other prevention strategies are mostly absent. To date, Tanzania has not approved a COVID-19 vaccine for use and has no plan to accept COVID-19 vaccines. According to the KAP COVID-19 vaccine acceptance data pool report, 61% of Tanzanians will probably or definitely plan to get a COVID-19 vaccine when it is available to them (37). In Tanzania, WV conducted a BA study interviewing 45 Acceptors and 45 Non-acceptors from selected communities in the Shinyanga Region of Tanzania.

Democratic Republic of Congo (DRC): As of 27 February 2021, there have been 25,792 confirmed cases of COVID-19 and 700 deaths. A survey of more than 15,000 adults conducted between August and December 2020 by the Africa Centres for Disease Control and Prevention (Africa CDC) and the London School of Hygiene & Tropical Medicine (LSHTM) found that COVID-19 Vaccine acceptance was 59% in the DRC (38). In the DRC, WV conducted a BA study interviewing 45 Acceptors and 45 Non-acceptors from all three health zones of Goma (Karisimbi, Nyirangongo, and Goma).

Methods

The study used a version of the Barrier Analysis rapid formative research methodology with some small modifications in data collection (by phone in Kenya rather than in-person interviews due to COVID-19-related movement restrictions). Determinants of acceptance were explored, adding additional determinants – on trust in COVID-19 vaccines and their perceived safety – that are expected to influence vaccine acceptance. Unlike most other BA studies, these studies focus on an *intended* rather than a currently practiced behaviour (since COVID-19 vaccines were not yet available in most of the study areas when data was collected). Barrier Analysis (BA) is a research tool that was developed in 1990 by Davis (39). Based on the Health Belief Model and the Theory of Reasoned Action, BA studies explore respondents' beliefs about a behaviour and about the problem or disease that the studied behaviour is expected to prevent. Sometimes certain beliefs are common in a population (e.g. that negative side effects are a risk with COVID-19 vaccination), but are not always associated with vaccine acceptance. (Indeed, this was found in the Bangladesh BA that is part of this study.) BA is meant to make up for that shortcoming by identifying beliefs and other responses revealing determinants that are associated with adoption of a behaviour (40). A key feature of BA is that responses from those doing a behaviour ('Doers' or 'Acceptors') are compared with responses from those who are not (the 'Non-doers' or 'Non-acceptors') so that the most important behavioural determinants can be identified. This approach is commonly used to identify behavioural determinants associated with a particular behaviour (e.g., vaccine acceptance, regular mask use, handwashing with soap, child marriage) so that practitioners and policy makers can develop more effective behaviour change messages and activities. BA has been used in 57 low-to-middle-income countries and used extensively by World Vision and 37 other organizations (personal communication with developer of the method,

T Davis, March 2021), and was used during both the [Ebola](#) (41) and COVID-19 pandemics (42). The beliefs and other responses regarding behavioural determinants assessed during BA (see Box 1) are identified with a focus on the most actionable findings. The other details of BA approach can be found elsewhere (39,43–47).

This study modified the standardized Barrier Analysis questionnaire from the *Designing for Behavior Change* (DBC) training manual (48) for exploring key beliefs and other responses regarding behavioural determinants. As recommended by the BA developers, (40,46) the research design began with defining the behaviour, the details of when and how the behaviour needs to be practiced, and – using information from earlier baseline studies – the priority groups for the behaviour (see Box 1).

Box 1: Key definitions based on Barrier Analysis approach

Key terms	Definition
Study behaviour	Intended acceptance of COVID-19 vaccines among adults living in different geographical areas (six studies).
Target group	Adult men and women 18 years and older
Details of the behaviour	Adult men and women 18 years or older of age living in [geographical area] have the stated intention to get a COVID-19 vaccine when one is available to them free of charge.
Behavioural determinants explored	
Perceived self-efficacy	An individual's belief that he/she can get a COVID-19 vaccine when it is available given his/her current knowledge, skills, and time. Things that make it easier and more difficult to get a COVID-19 vaccine were also assessed under this determinant.
Perceived social norms	The perception that most people important to an individual think that he/she should get a COVID-19 vaccine when it is available. Questions on who approves and disapproves of the respondent getting a COVID-19 vaccine were also assessed under this determinant. Respondents were also asked specifically about approval by medical staff (doctors and nurses) and community and religious leaders.
Perceived positive consequences	The positive things a person thinks will happen as a result of getting a COVID-19 vaccine (including the perceived advantages of getting a COVID-19 vaccine).
Perceived negative consequences	The negative things a person thinks will happen as a result of getting a COVID-19 vaccine (including the perceived disadvantages of getting a COVID-19 vaccine).
Access	The availability of the needed products or services required to do the behaviour. This includes real and perceived barriers related to the cost, distance, queue time, etc. In this study, we assessed perceived queue time, and availability of the vaccine near people's homes.
Cues to action / reminders	Whether a person can remember to do the behaviour, or remember to do the steps in doing the behaviour. (This potential determinant which is often explored with BA was not explored in this particular study as it was not expected to be salient for intended vaccine acceptance.)
Perceived susceptibility	A person's perception of how vulnerable to – or at risk they are of – getting a disease or problem that the behaviour is meant to prevent (e.g. COVID-19 disease in this study).
Perceived severity	The extent to which a person believes it would be serious if they (or members of their household) got the disease or problem that the behaviour is meant to prevent (e.g. COVID-19 disease in this study).
Perceived action efficacy	The extent to which a person believes that doing the behaviour will prevent the disease/problem that the behaviour is intended to prevent (in this study, whether one believes that getting a COVID-19 vaccine will prevent future COVID-19 infection).
Perceived divine will	The extent to which a person believes that it a deity (e.g. Allah or God or the gods) approves or disapproves of him/her doing the behaviour (e.g. getting a COVID-19 vaccine). Personal agency is sometimes explored under this determinant, as well. In this study, we explored whether people believed that getting COVID-19 was purely a matter of God's will or chance, or something that they could control.
Policy	The presence of laws and regulations that may affect whether people do the behaviour (e.g. get vaccinated with a COVID-19 vaccine in this study). This determinant was not explored in this study.

Key terms	Definition
Culture	The extent to which the respondent can cite cultural rules or taboos that affect whether they do the behaviour or not (e.g. get vaccinated with a COVID-19 vaccine in this study).

The BA questionnaire is divided into two main parts. The first part includes a set of screening questions to identify the participant as either an ‘Acceptor’ (a person who plans to get a COVID-19 vaccine when it is available) or a ‘Non-acceptor’ (a person who does not plan to get a COVID-19 vaccine when it’s available). In this screening section of the questionnaire, self-reported vaccination intention questions were included. (Please see **Supplementary file 1.**) In order to assess the determinants identified with BA (as referred to in Box 1), the second section consists of a set of open- and closed-ended questions organized by behavioural determinant. Based on input and a literature review from NGO experts who worked on increasing vaccine acceptance in the *Ebola Vaccine Deployment and Compliance Project*, several additional questions were added to the standard BA questionnaire to explore respondent’s beliefs on the safety and effectiveness of COVID-19 vaccines, trust in vaccine information provided by both community and religious leaders, exposure to misinformation, and level of education. Several countries also decided to omit questions based on their knowledge of the local context. Initially, the questionnaire was developed in English and then was translated into local languages and back-translated into English to check for accuracy.

Data collectors from World Vision’s *ENRICH* project in Bangladesh, Kenya, Myanmar and Tanzania, and World Vision staff in India and DRC were trained virtually on the data collection tool and the study methodology. The tool was tested before using it for the actual study. The Barrier Analysis approach recommends a sample size of 45 Doers (Acceptors) and 45 Non-doers (Non-acceptors) in order to detect statistically significant Odds Ratios of 3.0 or higher, when the alpha error is set to 5%, and a power of 80% is desired. The data collection team approached adult men and women until they reached at least 45 Acceptors and 45 Non-acceptors in each country. In each geographical area where the study was conducted in Bangladesh, India, Myanmar and Tanzania, enumerators used two-stage cluster sampling to first choose 45 clusters (usually villages) with their likelihood of being chosen being proportional to their population size, and then randomly chose a starting household using the spin-the-bottle technique used by UNICEF. At this starting household, an adult was chosen randomly, and assessed as to whether they were an Acceptor or Non-acceptor. Following this interview (or failing to find an interviewee in that starting household), enumerators moved to the next nearest household until both an eligible Acceptor or Non-acceptor was found in each cluster. Enumerators avoided choosing an Acceptor and Non-acceptor from the same household. In the DRC, respondents were chosen in three health zones of Goma (Karisimbi, Nyirangongo, and Goma). The 45 Doers and 45 Non-Doers were selected from informal worksite places within Goma city using the snowball sampling method, and only one respondent was chosen per worksite. In Kenya, rather than cluster or snowball sampling, telephone lists from beneficiaries enrolled in the ENRICH nutrition project were used to choose respondents randomly. In these studies:

- **Acceptors (Doers)** were adults 18 years and older who said that they were **somewhat likely** or **definitely likely** to seek a COVID-19 vaccine (that is, to go for vaccination) if it were made available to them in the coming month.

- **Non-acceptors (Non-doers)** were adults 18 years and older who said that they were **somewhat unlikely** to seek a COVID-19 vaccine, were **definitely unlikely** to seek a COVID-19 vaccine, **definitely would not seek** a COVID-19 vaccine, or **did not know** if they would seek a COVID-19 vaccine if it were made available to them in the coming month.
- Respondents were excluded if they were under 18 years of age, had never heard of COVID-19, would not say to what degree they were likely or unlikely to seek a COVID-19 vaccine, or did not want to participate in the study. The study respondents were informed of the study objectives prior to taking part in the interviews, and all respondents were asked to give their written consent before they were interviewed. Since this study was using a formative research tool regularly used in the course of routine project activities, and no risks to participants from participating in the study were identified, IRB approval was not sought.

Data collectors were informed of the study objectives prior to taking part in the interviews. All participants gave their consent before they were enrolled into the study. As part of the informed consent process, the purpose of the study and all study procedures were explained to them. All participants had the right to withdraw from the study at any moment, without jeopardizing their access to any services. The study presented no additional risks to participants. No participant was required to undergo any clinical procedure as a result of their participation in the study. Identifying data such as name, date of birth and address was not collected from the study participants.

Data analysis to identify the most important behavioural determinants of COVID-19 vaccine hesitancy in each country used the Barrier Analysis data tabulation sheet which generates p-values (related to differences between Acceptors and Non-acceptors), estimated relative risks, and other statistics. In order to rank ERRs when they could not be calculated – or were infinite – due to a zero cell, we changed the zero cell to 1 in order to get an estimation of the ERR. Where this is done, rather than providing an exact ERR, such as $ERR=8.2$, we express it as “ $ERR>8.2$ ”. Where ERRs were less than one, we express them as their reciprocal ($1/ERR$) to facilitate ranking and comparison. All findings presented below are at the $p<0.05$, with many being at the $p<0.01$ level or lower. (Please see the tables for exact p-values.)

Results

This six-country study on COVID-19 vaccine acceptance revealed **a very high association** (strong evidence, estimated relative risk or its reciprocal [ERR or $1/ERR$] of 8.0 or greater) between responses regarding eight behavioural determinants and vaccine acceptance in Bangladesh, Kenya, Tanzania, and DRC: perceived social norms, perceived positive consequences, perceived negative consequences, perceived risk of getting COVID-19, perceived severity of COVID-19, trust in COVID-19 vaccines, expected access to vaccines, and safety of COVID-19 vaccines. A **high level of association** (ERR or its reciprocal = 4.0 – 7.9) on responses regarding eleven of the behavioural determinants studied was found in the six study countries: perceived self-efficacy, perceived social norms, trust in COVID-19 vaccines, trust in leaders’ COVID-19 information, expected access to COVID-19 vaccines, perceived divine will, perceived action efficacy, perceived positive consequences, perceived negative consequences, perceived severity, and culture (e.g. cultural and religious reasons people plan to not get vaccinated). Findings are presented below, organized under each behavioural determinant.

Regarding **perceived social norms**, the study showed that close family members, friends, religious leaders, political and social leaders are key in influencing people's decision to get a COVID-19 vaccine. A strong majority of Acceptors believed that most of their close family and friends would get a COVID-19 vaccine in Bangladesh (100%), Myanmar (100%), Kenya (91%), Tanzania (62%), India (62%) whereas Non-acceptors were much less likely to believe that, and in some places strikingly less likely to believe that (38%, 84%, 36%, 0%, 22%, respectively). Acceptors were also more likely to say that most of their community leaders and religious leaders want them (or would want them) to get a COVID-19 vaccine in four of the five countries (all but DRC) where it was assessed. Acceptors were also more likely to say that they would get a COVID-19 vaccine if a health worker recommended it in four of the five countries where it was assessed. (India chose to omit these close-ended questions on perceived social norms, and only used the open-ended questions "who approves?" and "who disapproves?" instead. Kenya chose to omit the closed-ended questions on health workers approval.)

Related to social norms, in all four countries where this was assessed, Acceptors were more likely to say that they were very or somewhat likely to get a COVID-19 vaccine if a doctor or nurse recommended it. Conversely, Non-acceptors in these four countries were more likely to say that they are not likely to get the vaccine if a doctor or nurse recommends it. (This question was not asked in Kenya or India.)

When asked **whether they trust the COVID-19 vaccines**, Acceptors were more likely (than Non-acceptors) to say that they "trust it a lot" or "trust it a moderate amount" in all four of the countries where it was assessed. (India choose to not assess this question.) Non-acceptors were more likely to say that they "they have no trust at all" or only "trust them a little" in all five countries that assessed this. (India chose not to assess this.) The correlation between lack of trust in the vaccine and being a Non-acceptor was very high, especially in Kenya (ERR=17.9) and Tanzania (ERR>12).

To assess **perceived action efficacy**, respondents were asked how likely it would be that they would get COVID-19 disease after getting the COVID-19 (i.e., do they think the vaccine will work as intended to protect them from COVID-19). Acceptors were more likely to say that they would not be likely at all get COVID-19 after vaccination in Bangladesh, Kenya, and Tanzania. Conversely, Non-acceptors were more likely to say that they would be somewhat or very likely to get COVID-19 even after they were vaccinated in Bangladesh and the DRC. Despite being a vaccine acceptor, Acceptors in the DRC were more likely to say that they were still "somewhat likely" get COVID-19 after being vaccinated (than Non-acceptors). There were no statistically significant differences between the percentage of Acceptors and Non-acceptors responses for this question in India or Myanmar.

Respondents were asked how **safe** it would be for them to get a COVID-19 vaccine. Acceptors in all five of the countries where this was assessed (all but India) were more likely (than Non-acceptors) to say that it is "very safe" or "mostly safe." Conversely, Non-acceptors in all five countries where this was assessed were more likely to say that COVID-19 vaccines are "not safe at all."

In the DRC, respondents were also asked if they have previously received the Ebola vaccine. Acceptors were 1.6 times more likely to say that they have received it.

Acceptors in five of the six countries were more likely to say that they would have a very or somewhat high level of **trust in the information that government representatives and politicians provide** on the safety and effectiveness of COVID-19 vaccines. In India, paradoxically, Acceptors were more likely to say that they had a

very low level of trust in the COVID-19 vaccine info provided by these officials. Non-acceptors in Bangladesh, Myanmar, and DRC were more likely to have a **very or somewhat low level of trust** in COVID-19 vaccine information provided by the government or politicians than Non-acceptors. Similarly, Non-acceptors from India, Myanmar, and Tanzania are more likely to say that they have a “very low” or “somewhat low” level of trust in COVID-19 information provided by government representatives or politicians.

Acceptors in five of the six countries (all but India) were more likely to say that they would have a very or somewhat high level of **trust in the information that religious leaders provide on the safety and effectiveness of COVID-19 vaccines**. Conversely, Non-acceptors from five of the six countries (all but Kenya) said that they had a somewhat or very low trust in this information from religious leaders.

When asked about **advantages of vaccination with a COVID-19 vaccine**, Acceptors were more likely to say prevention from COVID-19 in five of the six countries. (There were no statistically-significant differences between the percentage of Acceptors and Non-acceptors giving particular advantages and disadvantages of COVID-19 vaccination in Kenya.) Acceptors in Bangladesh and Myanmar were more likely to say, “won’t transmit COVID-19 to others.” In Myanmar, Acceptors were also more likely to mention lifting of travel restrictions, and in Tanzania, Acceptors were more likely to mention being able to work and earn and income and to reduce the COVID-19 death rate, as well. Non-acceptors were more likely to say that there were no advantages in four of the six countries, as well (all but Kenya and Myanmar).

When asked about **disadvantages of vaccination with a COVID-19 vaccine**, Non-acceptors were more likely to say there were no advantages (or they did not know any) in four of the six countries (all but Kenya and Myanmar). Negative or serious side effects were mentioned more often by Non-acceptors in Myanmar. Interestingly, negative or serious side effects were mentioned more by Acceptors – who intended to get a vaccine nonetheless – in both India and DRC. In the DRC, Non-acceptors were more likely to mention both death and other serious diseases as a disadvantage of the getting a COVID-19 vaccine, and in Tanzania, Non-acceptors were more likely to mention impotence, cancer, dizziness, and reduced life expectancy. In Tanzania, Acceptors were more likely to mention a relative mild side effect, fever.

When assessing **perceived severity**, Acceptors were found to be more likely to believe that more people have had COVID-19 in Bangladesh, India and DRC. Interestingly, in Tanzania, Acceptors were more likely to say that no one has had COVID-19 in their community, while Non-acceptors were much more likely to say that “very few people” have had COVID-19. When asked if about the likelihood of someone in their household getting COVID-19 over the next three months, Acceptors in four of the six countries (Bangladesh, India, DRC and Tanzania) were all more likely to say that the likelihood was very or somewhat likely. Conversely, Non-acceptors in Bangladesh, DRC, and Tanzania were more likely (than Non-acceptors) to say that it was not likely at all that they or someone in their household would get COVID-19 in the next three months. Acceptors were also found to be more likely to say that that were moderately or very **concerned about getting COVID-19** in the next three months in DRC, Bangladesh, and Myanmar. (There were no statistically significant differences between the percentage of Acceptors and Non-acceptors who believed COVID-19 was serious or very serious in Myanmar.)

When assessing **perceived severity**, and in line with the Health Belief Model, Acceptors were more likely to believe that it would be very serious if they or someone in their household contracted COVID-19 in four of the six

countries (Bangladesh, Kenya, DRC, and Tanzania), and conversely, Non-acceptors in India were more likely to believe that COVID-19 was not serious at all.

Respondents were asked two questions regarding **perceived access to COVID-19 vaccines**: (1) “If a vaccine for COVID -19 were available in the country in the coming month free of charge, do you think that it would be available within 30 minutes’ walk from your home?” and (2) “If a vaccine for COVID -19 were available in the country in the coming month free of charge, how much time in minutes or hours do you think people would need to wait in queue, on average, to receive the vaccine?” (In the DRC, respondents were asked to rate the degree of difficulty in getting to the clinic where vaccines are normally offered instead.)

Acceptors were more likely to say that they believe it would be available 30 minutes from their home in Bangladesh, India, Myanmar, and Tanzania. In DRC, the question was modified to ask how difficult it would be to get to the site where vaccines are normally provided. There, Acceptors were more likely to say that it would not be difficult at all, and Non-acceptors were more likely to say that it would be very difficult. Regarding the question on expected queue time, results varied. In Bangladesh, Acceptors were more likely to say 60-90 minutes (from categories of 0-30 mins, 31-60 mins, 60-90 mins, 1.5 to 2 hours, or 2-3 hours) than Non-acceptors. In Tanzania, Acceptors were more likely to say 1.5 hours or more, and Non-acceptors expected queue times of 31-60 mins. (There were no statistically significant differences between Acceptors and Non-acceptors on the first question, and the second question was not asked in Kenya.)

Respondents were asked, “If a vaccine for COVID -19 were available to you in the coming month free of charge, what **might make it easier** for you to get that vaccine?” Acceptors were more likely to mention providing the vaccine close to their homes (India), providing it through satellite clinics, PHC sub-centres, and health facilities, and avoiding stock-outs (Bangladesh, India and Myanmar, and Kenya respectively), using convincing and clear information on the vaccines and their effects (DRC), and knowing that COVID-19 is dangerous and offering it free of charge (Tanzania).

Respondents were also asked what **might make it difficult** for them to get a COVID-19 vaccine. Non-acceptors were more likely than Acceptors to say lack of information or documentation, being too time consuming (India), cost of transportation and having a prolonged illness (Myanmar), uncertainty about COVID-19 being real (DRC), and not trusting COVID-19 vaccination or not having COVID-19 cases in their community (Tanzania) might make it difficult to get a COVID-19 vaccination.

When assessing **perceived divine will**, Acceptors from five of the six countries (all but India) were more likely to believe that God, Allah, or the gods approves (or approve) of getting a COVID-19 vaccine. (In India, Acceptors were more likely to say that a deity does not approve.)

Respondents were also asked whether or not they agreed with the statement, “Whether I get COVID-19 or not is purely a matter of God’s will or chance – the actions I take will have little bearing on whether or not I get COVID-19.” Non-acceptors were more with this statement in Bangladesh where Non-acceptors were more likely to say they agree a lot, and Acceptors more likely to say they agree a little. Unexpectedly, in Tanzania Acceptors were more likely to agree a little with the statement and Non-acceptors were more likely to disagree a lot.

However, their response to whether it is God’s will for them to get COVID-19 or not, varied. Non-acceptors from Bangladesh believe (“**Agree a lot**”) it is God’s will, and Non-acceptors from Tanzania “**disagree a lot**” that it is

God's will for them to get COVID-19 or not. Surprisingly, Acceptors in Bangladesh (80% of Acceptors vs. 27% of Non-acceptors) and in Tanzania (38% of Acceptors vs. 13% of Non –acceptors) believe (“**agree a little**”) that it is God's will or chance whether they get COVID-19 or not.

Discussion

A host of important associations between participants' responses and intended COVID-19 acceptance were found that can be useful in promotion of COVID-19 vaccines in the six-country study. The strongest associations found were regarding eight behavioural determinants of vaccine acceptance in Bangladesh, Kenya, Tanzania, and DRC: perceived social norms, perceived positive and negative consequences, perceived risk of getting COVID-19, perceived severity of COVID-19, trust in COVID-19 vaccines, safety of COVID-19 vaccines, and (expected) access to vaccines. Additional determinants were found to be important in Myanmar and India: perceived self-efficacy, trust in COVID-19 information provided by leaders, perceived divine will, perceived action efficacy of the COVID-19 vaccines, and culture (e.g. cultural and religious reasons people do not plan to get vaccinated).

The study revealed the powerful effect of perceived social norms on vaccination behaviour: Community leaders, religious leaders, close family members, and friends were reported to be very influential in mobilizing communities for COVID-19 vaccination as vaccines are made available in these countries, and it will be important that people see or hear that most people around them are planning to get a COVID-19 vaccine. The belief that “most people I know” are going to get vaccinated for COVID-19 was one of the strongest predictors of being a vaccine Acceptor. A strong majority – and, in Bangladesh and Myanmar, the totality – of Acceptors believed that most of their close family and friends would get a vaccine in all five countries. (Fewer people believed this in DRC [where the prevalence of vaccine acceptance was the lowest] but the belief was still more common in Acceptors [32%] than Non-acceptors [2%].) Perceptions of the degree to which community and religious leaders support COVID-19 vaccination was also important and shows the importance of mobilizing community and religious leaders to be involved in efforts to increase COVID-19 acceptance. Acceptors were much more likely to say that these leaders approve of their getting a vaccine in Bangladesh (100%), Myanmar (100%), Tanzania (100%), and Kenya (96%), whereas a much smaller proportion of Non-acceptors reported this (38%, 80%, 29%, and 53% respectively). Acceptors were found to be much more likely to have high levels of trust in government representatives, political leaders, and religious leaders than Non-acceptors.

Accurate and reliable information on the safety and effectiveness COVID-19 vaccines will need to be made available to populations in these countries through a variety of trusted channels and leaders to increase COVID-19 vaccine acceptance. Lack of trust in COVID-19 vaccines was common among Non-acceptors in all five of the countries where it was assessed (Bangladesh, Kenya, Myanmar, DRC, and Tanzania). Acceptors in all countries where perceptions of safety were assessed were more likely to believe that it would be very or mostly safe for them to get a vaccine. Acceptors in Bangladesh, Kenya, DRC, and Tanzania were also much more likely to believe that COVID-19 vaccines work (i.e., that they will not get COVID-19 after being vaccinated). Information will need to be disseminated to counter (but not to repeat) common myths about the vaccines' safety and effectiveness, such as beliefs in the DRC and Myanmar that the vaccines have negative and potentially deadly side effects, and beliefs about the vaccines causing impotence in Tanzania.

As expected, prevention of COVID-19 was mentioned as an advantage by Acceptors (more often than Non-acceptors) in five of the six study countries (all but Kenya where that advantage was mentioned by high proportions of both Acceptors and Non-acceptors). However, the findings on other benefits of COVID-19 vaccination – such as being able to travel in Myanmar and being able to work and earn an income in Tanzania – should be leveraged to increase vaccine acceptance in those countries.

As predicted by the Health Belief Model, beliefs about COVID-19 and its prevalence and severity were strongly associated with vaccine acceptance and should be taken into account when developing messages and activities to promote COVID-19 vaccines. In Bangladesh, India, and DRC, Acceptors were more likely to believe that more people have been infected with COVID-19. In Bangladesh, India, DRC, and Tanzania, Acceptors were more likely to believe that it was likely that someone in their household would get COVID-19 in the next three months. In Myanmar and DRC, concern about getting COVID-19 was much higher among Acceptors than Non-acceptors. Acceptors in Bangladesh, Kenya, DRC, and Tanzania were much more likely to believe that COVID-19 was very serious, and in India, Non-acceptors were more likely to say that COVID-19 was not serious at all.

Even before vaccines begin rolling out in many communities, people's beliefs about access – such as expected queue times and the difficulty of getting to places where vaccines are normally available – were found to be highly associated with vaccine acceptance. For example, Acceptors in Bangladesh, India, Myanmar, and Tanzania were much more likely to say that they expect that COVID-19 vaccines will be available within 30 minutes of their home, and Acceptors in the DRC (who were asked a similar but not identical question) were more likely to say that it would not be difficult at all to get to a vaccination site. Regarding expected queue times, countries varied. In Bangladesh, Acceptors were more likely to expect shorter queue times, while in Tanzania, Acceptors were more likely to expect longer queue times (of 1.5 hours or more) than Non-acceptors.

The findings regarding what makes COVID-19 vaccination easier or more difficult can provide clues to communication and vaccination strategies. Acceptors were more likely to mention access-related issues that could make vaccines easier to get, such as providing them by NGOs, through satellite clinics and sub-centres, and assuring vaccines are available on time, in the right places, without stock outs, and free of charge. Providing clear and convincing information was also mentioned. Similarly, Non-acceptors were more likely to mention costs in money and time, having prolonged illnesses, lack of information and trust in the vaccines as things that would make getting a COVID-19 vaccine more difficult.

There is a growing body of evidence on the impact of faith leaders and faith beliefs on health and other behaviours. This study found that Acceptors were much more likely to believe that a deity (God, Allah, the gods) approved of them getting a COVID-19 vaccine in all six countries. However, the correlation between personal agency and vaccine acceptance was mixed. In Tanzania, Acceptors were more likely to agree that getting COVID-19 was “purely a matter of God's will or chance” while Non-acceptors were much more likely to strongly disagree with that statement, whereas in Bangladesh, Non-acceptors were much more likely to say that they strongly agreed with that statement (than Acceptors).

Conclusion

In conclusion, COVID-19 vaccine hesitancy is a roadblock that many countries are facing along the road to herd immunity and an end to the pandemic. This study shows that there are many behavioural determinants

associated with vaccine acceptance which need to be explored through formative research to better understand which messages and activities should be used to counter vaccine hesitancy and refusal. These determinants can vary from country to country, but certain ones (e.g., perceived social norms, perceived severity of COVID-19, perceived divine will) may be reliably found to be important in many countries.

National and local plans for COVID-19 vaccination should include the participation of community and faith leaders, health workers (including community health workers), and others to mobilize communities for COVID-19 prevention, case detection and referral, including promotion of COVID-19 vaccination. It is crucial to empower these leaders with trustworthy information on COVID-19 and the safety and effectiveness of COVID-19 vaccines, but also on the probable and varied behavioural determinants of COVID-19 vaccination in their area. The decision to seek or not seek vaccination is not solely reliant on one's views concerning the safety and effectiveness of vaccines or other beliefs about vaccines (e.g., side effects, myths). Tools and resources for these leaders and workers should be contextualized using data on the determinants of vaccine hesitancy in a given area or country. Strategies for COVID-19 prevention (including by not limited to COVID-19 vaccination) may need to address many of these determinants to be effective.

Declarations

Conflicts of Interest: None to declare.

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Table

Table 1: Reference: Degree of Association between Behavioral Determinant and
COVID-19 Vaccine Acceptance by country

Determinants	Bangladesh	India	Kenya	Myanmar	DRC	Tanzania
Vaccine Acceptance (at time of study)	64%	41%	40%	75%	59%	61%
Perceived Self-efficacy	✓	✓ ✓	✗	✓ ✓	✓ ✓ ✓	✓ ✓ ✓
Perceived Social Norms	✓ ✓ ✓	✓ ✓	✓ ✓ ✓	✓ ✓	✓ ✓	✓ ✓ ✓
Access	✓	✓	✗	✓ ✓	✓ ✓ ✓	✓ ✓
Perc. Positive Consequences	✓ ✓ ✓	✓ ✓	✗	✓	✓ ✓ ✓	✓ ✓ ✓
Perc. Negative Consequences	✗	✓	✗	✓	✓ ✓	✓ ✓
Perc. Susceptibility / Risk (of getting C-19)	✓ ✓ ✓	✓	✗	✓	✓	✓ ✓ ✓
Perc. Severity	✓ ✓	✓	✓ ✓	✗	✓	✓
Perc. Action Efficacy	✓ ✓	✗	✓	✗	✓	✓
Perc. Divine Will	✓ ✓	✓	✓ ✓	✓	✓	✓
Trust (in information)	✓	✓ ✓	✓ ✓ ✓	✓	✓	✓ ✓
Trust (in vaccine)	✓ ✓	(not asked)	✓ ✓ ✓	✓ ✓	✓	✓ ✓ ✓
Safety	✓	(not asked)	✓ ✓ ✓	✓	✓	✓ ✓ ✓
Cultural (taboos, etc.)	✓ ✓	✓ ✓	✗	✗	✓	✓
Other correlate (e.g. educational level)	✓ ✓	(not asked)	✗	✗	✓ ✓	✓

• One check: Estimated Relative Risk (ERR) <4; Two checks ERR 4.0-7.9; Three checks: ERR > 8.0 or greater; ERR shows the level of association between the determinant and vaccine acceptance.

Figures

Acceptors vs. Non-acceptors: Perceived Social Norms
Dec. 2020.

Figure 1

Perceived social-norms on COVID-19 vaccine hesitancy, Dec. 2020

Figure 2

Acceptors and Non-acceptors trust in COVID-19 vaccines by country, Dec. 2020

Figure 3

Figure 4

Acceptors and Non-acceptors beliefs on safety of getting a COVID-19 vaccine by country, Dec. 2020

**Acceptors vs. Non-acceptors:
Degree of Trust in Information on COVID-19 provided by Leaders
by country, Dec. 2020 .**

Figure 5

Acceptors and Non-acceptors trust level in COVID-19 safety and effectiveness information by source of information

Figure 6

Perceived positive and negative consequences (advantages and disadvantages) of getting a COVID-19 vaccine by country, Dec.2020

**Acceptors vs. Non-acceptors: Perceived Susceptibility / Risk of getting
C-19: Bangladesh, India, Myanmar, Dec. 2020**

Figure 7

Perceived Susceptibility/ Risk of getting COVID-19: Bangladesh, India, Myanmar, Dec.2020

Figure 8

Perceived Susceptibility/ Risk of getting COVID-19: DRC and Tanzania, Dec.2020

Acceptors vs. Non-acceptors:
Perceived Severity of COVID-19, Dec. 2020

Figure 9

Perceived Severity of COVID-19 by country, Dec.2020

Acceptors vs. Non-acceptors:
Perceived access to COVID-19 vaccines, Dec. 2020

Figure 10

Figure 11

What might make COVID-19 easier?

Figure 12

What might make COVID-19 vaccination difficult?

Figure 13

Perceived divine will regarding COVID-19 vaccination by country, Dec.2020

Supplementary Files

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