COVID-19 vaccine acceptance among high-risk populations in Uganda

Felix Bongomin (iD), Ronald Olum (iD), Irene Andia-Biraro, Frederick Nelson Nakwagala, Khalid Hudow Hassan, Dianah Rhoda Nassozi, Mark Kaddumukasa, Pauline Byakika-Kibwika, Sarah Kiguli and Bruce J. Kirenga

Abstract

Background: Immunization is an important strategy for controlling the COVID-19 pandemic. COVID-19 vaccination was recently launched in Uganda, with prioritization to healthcare workers and high-risk individuals. In this study, we aimed to determine the acceptability of COVID-19 vaccine among persons at high risk of COVID-19 morbidity and mortality in Uganda.

Methods: Between 29 March and 14 April 2021, we conducted a cross-sectional survey consecutively recruiting persons at high risk of severe COVID-19 (diabetes mellitus, HIV and cardiovascular disease) attending Kiruddu National Referral Hospital outpatient clinics. A trained research nurse administered a semi-structured questionnaire assessing demographics, COVID-19 vaccine related attitudes and acceptability. Descriptive statistics, bivariate and multivariable analyses were performed using STATA 16.

Results: A total of 317 participants with a mean age 51.5 ± 14.1 years were recruited. Of this, 184 (60.5%) were female. Overall, 216 (70.1%) participants were willing to accept the COVID-19 vaccine. The odds of willingness to accept COVID-19 vaccination were four times greater if a participant was male compared with if a participant was female [adjusted odds ratio (AOR): 4.1, 95% confidence interval (CI): 1.8–9.4, $p = 0.00$]. Participants who agreed (AOR: 0.04, 95% CI: 0.01–0.38, $p = 0.003$) or strongly agreed (AOR: 0.04, 95% CI: 0.01–0.59, $p = 0.005$) that they have some immunity against COVID-19 were also significantly less likely to accept the vaccine. Participants who had a history of vaccination hesitancy for their children were also significantly less likely to accept the COVID-19 vaccine (AOR: 0.1, 95% CI: 0.01–0.58, $p = 0.016$).

Conclusion: The willingness to receive a COVID-19 vaccine in this group of high-risk individuals was comparable to the global COVID-19 vaccine acceptance rate. Increased sensitization, myth busting and utilization of opinion leaders to encourage vaccine acceptability is recommended.

Keywords: COVID-19, high-risk population, Uganda, vaccines

Correspondence to:
Felix Bongomin
Department of Medical Microbiology and Immunology, Faculty of Medicine, Gulu University, P.O. Box 166, Gulu, Uganda

Department of Medicine, School of Medicine, Makerere University College of Health Sciences, Kampala, Uganda
drbongomin@gmail.com

Ronald Olum
Irene Andia-Biraro
Khalid Hudow Hassan
Mark Kaddumukasa
Pauline Byakika-Kibwika
Department of Medicine, School of Medicine, Makerere University College of Health Sciences, Kampala, Uganda

Frederick Nelson Nakwagala
Department of Medicine, Mulago National Referral Hospital, Kampala, Uganda

Dianah Rhoda Nassozi
Department of Dentistry, School of Health Sciences, Makerere University College of Health Sciences, Kampala, Uganda

Sarah Kiguli
Department of Pediatrics & Child Health, School of Medicine, Makerere University College of Health Sciences, Kampala, Uganda

Bruce J. Kirenga
Department of Medicine, School of Medicine, Makerere University College of Health Sciences, Kampala, Uganda

Lung Institute Makerere University, Kampala, Uganda

Introduction

The coronavirus disease-2019 (COVID-19) pandemic is a major global health crisis of the 21st century.[1] Approximately 2.3% of the world's population has now been infected by the severe acute respiratory coronavirus-2 (SARS CoV-2), the novel coronavirus and etiologic agent of COVID-19, and more than 3.3 million people have died.[2] In addition, thousands of individuals who have recovered from COVID-19 illness have been left with long-term complications – dubbed "long COVID-19" – and other chronic COVID-19 syndromes.[3]

COVID-19-related morbidity and mortality in high-risk individuals, such as those with diabetes mellitus and cardiovascular diseases, is substantial and current treatment options are limited.[4–6]

Fortunately, with the global rollout of the COVID-19 vaccines, there is emerging evidence that the COVID-19 vaccines can reduce the severity of infection and prevent deaths.[7] Real world data emanating from a nationwide mass vaccination program in Israel, in an uncontrolled setting, have recently shown that the BNT162b2 mRNA vaccine was effective for preventing symptomatic COVID-19, COVID-19-related hospitalization, severe illness and death.[8]

Globally, over 1.3 billion doses of the COVID-19 vaccines have been administered with about 4.1% of the population being fully vaccinated as of 10 May 2021.[9] However, a recent survey has shown that the potential acceptance of these vaccines varies from country to country, with over 80% acceptance in China, Singapore and South Korea to less than 55% in Russia.[10] Some of the main reasons for reporting non-intent to receive vaccine were concerns about vaccine side effects and safety and lack of trust in the vaccine development process.[11,12]

In Uganda, COVID-19 vaccination with the AstraZeneca vaccine was launched on 10 March 2021, with priority being given to healthcare workers and individuals at risk of severe COVID-19 and death. However, little is known about acceptance of receiving the vaccine among Ugandans, especially in the priority groups. Reports from the government of Uganda also indicate there is a slow uptake of the COVID-19 vaccine in the country, with only about 400,000 people vaccinated by 10 May 2021.[13] Therefore, in this study, we assessed the acceptability of COVID-19 vaccines and associated factors among persons at high risk of severe COVID-19 attending a large tertiary health facility in Uganda.

Methods

Study design
A descriptive, cross-sectional study employing quantitative techniques was conducted between 29 March and 14 April 2021.

Study setting
The study was carried out at Kiruddu National Referral Hospital (KNRH). KNRH is a public tertiary referral hospital that offers a wide array of inpatient and outpatient healthcare services mainly in internal medicine, radiology, plastic and reconstructive surgery and radiology. There are established outpatient clinics that run from Monday to Friday every week. The cardiovascular disease clinics run on Monday and Tuesday, diabetes clinic on Wednesday and HIV clinic on Friday. The clinic has an average attendance of 100–150 adults. KNRH is one of the sites offering COVID-19 vaccines to healthcare workers and high-risk individuals. At the time of data collection, vaccination was on going at the study site.

Study population
Patients attending outpatient clinics at KNRH constituted the study population. Eligible participants were those aged 18 years or older, living with diabetes, HIV, or any cardiovascular diseases who provided an informed written consent to participate in the study. Patients aged 50 years or older with or without any co-morbidity were included in the study. Patients who presented with severe, acute complications of diabetes mellitus, hypertensive crisis and HIV complications requiring inpatient care were excluded from the study.

Sampling size
The sample size was calculated using Epi Info 7 StatCalc (Centers for Disease Control and Prevention, Atlanta, Georgia, United States) for population surveys. About 250 outpatients are seen on a daily basis at KNRH; however, numbers may be lower due to the COVID-19 pandemic. Data were collected over a period of 2 weeks (10 working days), giving an attendance of 2500 patients. Using an expected attendance of 2500, expected acceptability of 50% since no studies in similar settings exist, design effect of 1.0 and margin of error of 5%, the calculated required sample size was 333 patients.

Study procedure
Eligible participants were enrolled by consecutive sampling until the required sample size was reached. Two trained research nurses and two medical doctors recruited the patients in the study, obtained written informed consent and administered the questionnaires. Independent variables were: demographic details, which included sex, age, profession, highest level of education, religion, residence, marital status and

estimated monthly income. Dependent variables were: primary outcome variable – acceptability of COVID-19 vaccine, which was assessed using a closed ended question with a Yes/No response. Secondary outcome variable was vaccine hesitancy – evaluated as trust and attitudes towards the COVID-19 vaccine based on two closed ended questions with a Yes/No response. We validated this questionnaire in a population of medical students in Uganda.[14]

The COVID-19 standard operating procedures set by the Ministry of Health, Uganda, were strictly adhered to throughout the study. Study staffs were equipped with personal protective equipment such as a facemask and a hand sanitizer.

Data management and analyses
Fully completed questionnaires were entered into EpiCollect 5® and exported as a spreadsheet. The data were then exported to STATA version 16.0 (StataCorp LLC., College Station, Texas, USA) for formal analysis. Categorical variables were first described as frequencies and percentages, numerical variables as mean or median as appropriate. To evaluate the association of independent variables, that is, demographics with the acceptability of COVID-19 vaccine, a bivariate analysis (chi-square or Fisher's exact test) was performed. All factors with a $p < 0.2$ were included in a multivariable logistic regression model to adjust for confounders. Associations with $p < 0.05$ were considered statistically significant. Results are presented in tables, charts and graphs, as appropriate.

Ethical considerations
The study protocol was approved by the Mulago Hospital Research Ethics Committee (MHREC), approval number MHREC2014. Administrative clearance was sought from the KNRH Institutional Review Board. The study was conducted in accordance to the ethical codes outlined in the Declaration of Helsinki and all participants provided written informed consent.

Results

Characteristics of participants
A total of 317 patients (response rate = 95%) at high risk of severe COVID-19 participated in this

study. The mean age of the participants was 51.5 years (standard deviation = 14.1) and about two-thirds ($n = 184$, 60.5%) of the patients were female. Some 36.4% of the patients were unemployed and 67.4% were living in urban settlements. Table 1 summarizes the characteristics of the participants. Cardiovascular diseases ($n = 188$, 61.4%) were the most common comorbidities (Figure 1), followed by diabetes mellitus ($n = 102$, 33.3%) and HIV ($n = 46$, 15.0%).

COVID-19 risk perceptions and tests
More than half of the patients felt very likely to or extremely at risk of getting COVID-19 in the future (Table 2). In addition, up to 40.8% ($n = 124$) and 59.2% ($n = 181$) of the patients felt very worried about COVID-19 and at a major risk, respectively. Of note, only a few patients ($n = 8$, 2.6%), any of their friends ($n = 17$, 5.6%) or a member of their family ($n = 15$, 5.0%) had tested positive for COVID-19. Up to 62.5% of the patients disagreed that they had some immunity against COVID-19.

Vaccine hesitancy
Hesitancy towards previous vaccines among patients who had children was relatively very low. Only 5.7% ($n = 17$) and 3.8% ($n = 11$) had been hesitant or had refused to have their children vaccinated, respectively (Figure 2). Among these, the issues of vaccine safety and efficacy were the most common reasons for hesitancy (Figure 3).

COVID-19 vaccine perceptions and acceptability
The vast majority ($n = 295$, 96.4%) were aware about the COVID-19 vaccine and over 50% of the patients agreed that the vaccine might be effective in protecting them against COVID-19. Up to 82.4% ($n = 243$) had ever heard negative information on the COVID-19 vaccine, and most of this was from friends (76.1%) and social media (35.0%).

Overall, 216 patients (70.1%) were willing to accept the COVID-19 vaccines. Self-protection, government recommendations and health-workers' recommendations were the most frequent reasons for accepting the vaccine (Table 3). Of the 92 patients who were not willing to accept the COVID-19 vaccine, negative information and

Table 1. Socio-demographic characteristics of the participants.

Demographics (*N* = 308)	Frequency	%
Age (mean years and standard deviation)	51.5	14.1
<50 years	126	40.9
50+ years	182	59.1
Sex (*n* = 304)		
Male	120	39.5
Female	184	60.5
Marital status (*N* = 305)		
Never married	18	5.9
Married	172	56.4
Divorced/widowed/separated	115	37.7
Religion		
Anglican	104	33.8
Roman Catholic	99	32.1
Muslim	53	17.2
Pentecostal	42	13.6
SDA	1	0.3
Atheist	9	2.9
Highest level of education		
None	23	7.5
Primary	127	41.2
Secondary	101	32.8
Tertiary	57	18.5
Occupation		
Unemployed	112	36.4
Employee	64	20.8
Self employed	132	42.9
Residence (*N* = 291)		
Rural	95	32.6
Urban	196	67.4
Estimated monthly income (UGX; *N* = 179)	300,000	100,000–600,000

SDA, Seventh Day Adventist.

safety concerns were the most frequent reasons (Table 3).

Factors associated with COVID-19 vaccine acceptability

At bivariate analysis, sex (*p* = 0.005), perceived risk of future COVID-19 (*p* = 0.006), extent of worrying about the COVID-19 disease (*p* = 0.016), current perceived risk of COVID-19 (*p* < 0.001), perceived immunity to COVID-19 (*p* < 0.001), and perceived efficacy of the COVID-19 vaccine (*p* < 0.001)) were significantly associated with COVID-19 vaccine acceptability (Table 4). A history of vaccine hesitancy (*p* < 0.001) or refusal (*p* = 0.013) were also significantly associated with acceptability (Table 4).

At multivariable analysis (Table 5), the odds of willingness to accept COVID-19 vaccination were four times greater if a participant was male compared with if a participant was female [adjusted odds ratio (AOR): 4.1, 95% confidence interval (CI): 1.8–9.4, *p* = 0.001]. Patients who agreed (AOR: 0.04, 95% CI: 0.01–0.38, *p* = 0.003) or strongly agreed (AOR: 0.04, 95% CI: 0.01–0.59, *p* = 0.005) that they had some immunity against COVID-19 were also significantly less likely to accept the vaccine. Finally, patients who had a history of vaccine hesitancy for their children were also significantly less likely to accept the COVID-19 vaccine (AOR: 0.1, 95% CI: 0.01–0.58, *p* = 0.016). Perceived risks to COVID-19 and perceived efficacy of the COVID-19 vaccine lost significance at multivariable analyses.

Discussion

In this study, we assessed for the acceptability of COVID-19 vaccine among persons at high risk of COVID-19 morbidity and mortality in Uganda. About 70% of the study population was willing to receive the vaccine. Perceived risk of future COVID-19, extent of worrying about COVID-19, current perceived risk of COVID-19, perceived immunity to COVID-19 and perceived efficacy of the COVID-19 vaccine were significantly associated with COVID-19 vaccine acceptability.

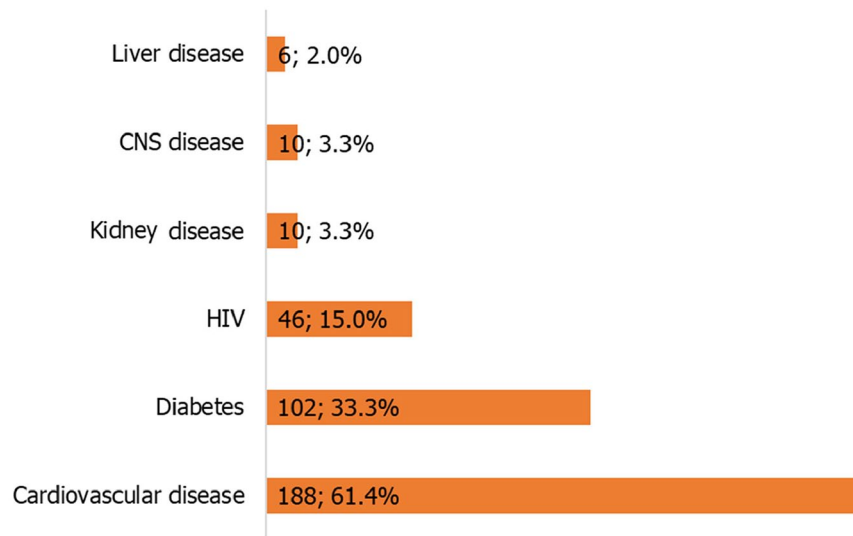Interestingly, our recently concluded survey of over 600 medical students in Uganda showed

Figure 1. Comorbidities among the participants.

Table 2. COVID-19 risk perceptions among patients at high risk of COVID-19 disease.

Perception	*N*	Frequency	%
How likely do you think you will get COVID-19 in future?	301		
Extremely likely		27	9.0
Very likely		160	53.2
Moderate		26	8.6
Slightly		47	15.6
Not at all		41	13.6
Overall, how worried are you about coronavirus?			
Extremely worried	304	124	40.8
Very worried		107	35.2
Not very worried		23	7.6
Somewhat worried		27	8.9
Not at all worried		23	7.6
To what extent do you think coronavirus poses a risk to you personally?			
Major risk	306	181	59.2
Moderate risk		64	20.9
Minor risk		35	11.4
No risk at all		26	8.5

(continued)

Table 2. (continued)

Perception	N	Frequency	%
Do you think coronavirus poses a risk to people in Uganda?			
Major risk	304	168	55.3
Moderate risk		95	31.3
Minor risk		31	10.2
No risk at all		10	3.3
Do you know if you have had, or currently have, coronavirus?			
I have definitely had it	306	9	2.9
I think I have probably had it		5	1.6
I think I have probably not had it		135	44.1
I have definitely not had it		157	51.3
Have you been tested for coronavirus?			
No	305	269	88.2
Yes – positive		8	2.6
Yes – negative		28	9.2
Has any of your family members tested for COVID-19?			
No	303	270	89.1
Yes – positive		15	5.0
Yes – negative		18	5.9
Has any of your friends tested positive for COVID-19?			
No	306	278	90.9
Yes – positive		17	5.6
Yes – negative		11	3.6
I think I have some immunity to coronavirus			
Strongly agree	299	11	3.7
Agree		40	13.4
Neither agree nor disagree		61	20.4
Disagree		164	54.9
Strongly disagree		23	7.7

that only 37.3% were willing to receive a COVID-19 vaccine.[14] This might be due to lack of correct information regarding the vaccine among medical students, which could have been consolidated by the current wave of speculations on the safety, especially the reported incidence of blood clots in
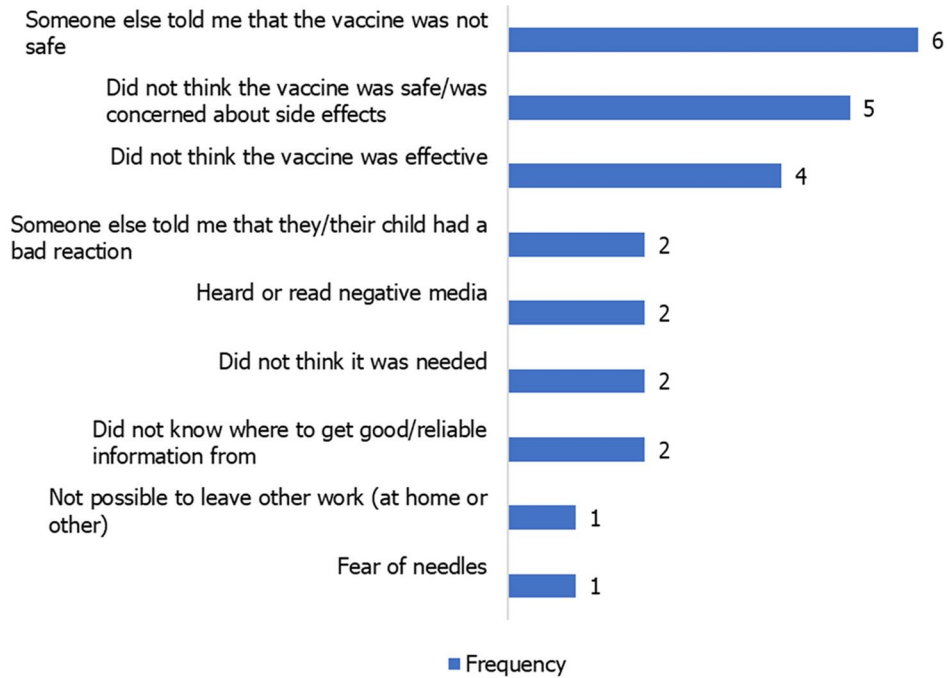
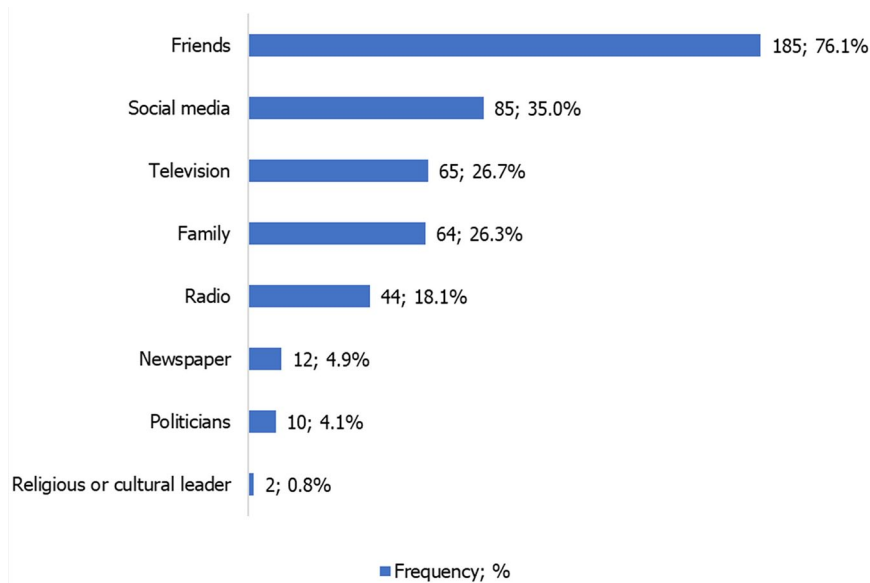**Figure 2.** Reasons for refusing children access to vaccinations.

Figure 3. Sources of negative information on the COVID-19 vaccine among participants.

AstraZeneca and Johnson & Johnson vaccines.[15] Medical students in our recent study also reported low perceived risk as a major factor for lack of willingness to accept the vaccine.[14] However, our finding is consistent with a global COVID-19 vaccine acceptability survey in which over 72% of over 13,000 individuals from 19 countries across the world were willing to receive a proven, safe and effective COVID-19 vaccine.[10]

In our study, male patients were more likely to accept the COVID-19 vaccine. This corroborates

Table 3. Reasons for COVID-19 vaccine acceptability among patients at high risk of severe COVID-19 disease.

	Frequency	%
Reason for accepting the vaccine (*N* = 216)		
To protect myself from getting COVID-19	203	94.0
Government recommendations	148	68.5
Health workers' recommendations	101	46.8
I am at high risk of severe disease	79	36.6
If it is available to me	69	31.9
If the vaccine is free of charge	36	16.7
The vaccines are safe	33	15.3
It is a social and moral responsibility	32	14.8
To protect others from getting COVID-19	22	10.2
I believe in vaccines and immunization	22	10.2
The vaccines are effective	22	10.2
To be able to travel	20	9.3
To get rid of the virus and end the pandemic	13	6.0
Job requirement	4	1.9
Reason for refusing the COVID-19 vaccine (*N* = 92)		
I have heard or read negative information on the vaccine	59	64.1
I don't think the vaccine is safe	53	57.6
I don't think the vaccine is effective	45	48.9
Someone else told me that the vaccine is not safe	43	46.7
I don't think it is needed	26	28.3
I don't know where to get good/reliable information	21	22.8
I trust my immunity	8	8.7
Had a bad experience with previous vaccinator/health clinic	7	7.6
I don't know where to get vaccination	4	4.3
Had a bad experience or reaction with previous vaccination	3	3.3
The vaccine is costly for me	3	3.3
Fear of needles	2	2.2
Someone else told me they/their child had a bad reaction	2	2.2
Religious reasons	1	1.1
Not possible to leave other work	1	1.1

Table 4. A bivariate analysis showing factors associated with COVID-19 vaccine acceptability among patients at high risk of severe COVID-19 disease.

Variables	Acceptability		
	No n = 92	Yes n = 216	*p*
Age			
<50 years	40 (31.7)	86 (68.3)	0.550
50+ years	52 (28.6)	130 (71.4)	
Sex, N = 304			
Male	25 (20.8)	95 (79.2)	0.005
Female	66 (35.9)	118 (64.1)	
Marital status, N = 305			
Never married	5 (27.8)	13 (72.2)	0.109
Married	43 (25)	129 (75)	
Divorced/widowed/separated	42 (36.5)	73 (63.5)	
Religion			
Anglican	33 (31.7)	71 (68.3)	0.101
Roman Catholic	28 (28.3)	71 (71.7)	
Muslim	10 (18.9)	43 (81.1)	
Pentecostal	15 (35.7)	27 (64.3)	
SDA	1 (100)	0 (0)	
Atheist	5 (55.6)	4 (44.4)	
Highest level of education			
None	10 (43.5)	13 (56.5)	0.170
Primary	43 (33.9)	84 (66.1)	
Secondary	25 (24.8)	76 (75.2)	
Tertiary	14 (24.6)	43 (75.4)	
Occupation			
Unemployed	30 (26.8)	82 (73.2)	0.247
Employee	16 (25)	48 (75)	
Self employed	46 (34.8)	86 (65.2)	
Residence, N = 291			
Rural	28 (29.5)	67 (70.5)	0.873
Urban	56 (28.6)	140 (71.4)	

(continued)

Table 4. (continued)

Variables	Acceptability		
	No *n* = 92	**Yes** *n* = 216	*p*
Number of comorbidities			
One	71 (27.8)	184 (72.2)	0.207
Two	19 (40.4)	28 (59.6)	
Three	2 (33.3)	4 (66.7)	
How likely do you think you will get COVID-19 in future?			
Extremely likely	4 (14.8)	23 (85.2)	0.006
Moderate	5 (19.2)	21 (80.8)	
Not at all	22 (53.7)	19 (46.3)	
Slightly	13 (27.7)	34 (72.3)	
Very likely	47 (29.4)	113 (70.6)	
Overall, how worried are you about coronavirus?			
Extremely	35 (28.2)	89 (71.8)	0.016
Not at all	10 (43.5)	13 (56.5)	
Not very	13 (56.5)	10 (43.5)	
Somewhat	9 (33.3)	18 (66.7)	
Very	25 (23.4)	82 (76.6)	
To what extent do you think coronavirus poses a risk to you personally?			
Major risk	49 (27.1)	132 (72.9)	<0.001
Minor risk	20 (57.1)	15 (42.9)	
Moderate risk	11 (17.2)	53 (82.8)	
No risk at all	11 (42.3)	15 (57.7)	
Do you think coronavirus poses a risk to people in Uganda?			
Major risk	42 (25)	126 (75)	0.245
Minor risk	11 (35.5)	20 (64.5)	
Moderate risk	34 (35.8)	61 (64.2)	
No risk at all	3 (30)	7 (70)	
Do you know if you have had, or currently have, coronavirus?			
I have definitely had it	3 (33.3)	6 (66.7)	0.497
I have definitely not had it	45 (28.7)	112 (71.3)	
I think I have probably had it	3 (60)	2 (40)	
I think I have probably not had it	39 (28.9)	96 (71.1)	

(continued)

Table 4. (continued)

Variables	Acceptability		
	No *n = 92*	**Yes** *n = 216*	*p*
Have you been tested positive for coronavirus?			
Yes	2 (25)	6 (75)	0.747
No	90 (30.3)	207 (69.7)	
Has any of your family members positive tested for COVID-19?			
Yes	4 (26.7)	11 (73.3)	0.749
No	88 (30.6)	200 (69.4)	
Has any of your friends tested positive for COVID-19?			
Yes	6 (35.3)	11 (64.7)	0.606
No	85 (29.4)	204 (70.6)	
I think I have some immunity to coronavirus			
Agree	17 (42.5)	23 (57.5)	<0.001
Disagree	28 (17.1)	136 (82.9)	
Neutral	33 (54.1)	28 (45.9)	
Strongly agree	7 (63.6)	4 (36.4)	
Strongly disagree	4 (17.4)	19 (82.6)	
Have you been hesitant to have your children vaccinated?			
Yes	13 (76.5)	4 (23.5)	<0.001
No	73 (26.2)	206 (73.8)	
Have you ever refused to have your children vaccinated?			
Yes	7 (63.6)	4 (36.4)	0.013
No	80 (28.6)	200 (71.4)	
Are you aware of the COVID-19 vaccine?			
Yes	87 (29.5)	208 (70.5)	0.257
No	5 (45.5)	6 (54.5)	
COVID-19 vaccine may be effective in protecting me from COVID-19			
Agree	18 (13.2)	118 (86.8)	<0.001
Disagree	13 (59.1)	9 (40.9)	
Neutral	50 (44.6)	62 (55.4)	
Strongly agree	5 (19.2)	21 (80.8)	
Strongly disagree	5 (62.5)	3 (37.5)	

(continued)

Table 4. (continued)

Variables	Acceptability		
	No ***n*=92**	**Yes** ***n*=216**	***p***
Have you ever received or heard negative information about COVID-19 vaccination?			
No	12 (23.1)	40 (76.9)	0.164
Yes	80 (32.9)	163 (67.1)	

SDA, Seventh Day Adventist.

Table 5. Multivariable analysis model showing associations with COVID-19 acceptability among patients at high risk of severe disease.

Variables	AOR (95% CI)	*p*
Sex, *N*=304		
Female	Reference	
Male	4.1 (1.8–9.4)	0.001
Marital status, *N*=305		
Never married	Reference	
Married	2.3 (0.2–21.3)	0.468
Divorced/widowed/separated	1.6 (0.2–15.3)	0.689
Religion		
Anglican	Reference	
Roman Catholic	2.1 (0.9–5.0)	0.094
Muslim	2.9 (0.9–9.6)	0.087
Pentecostal	1.6 (0.5–4.9)	0.441
Atheist	0.2 (0.0–2.4)	0.227
Highest level of education		
None	Reference	
Primary	1.2 (0.3–4.9)	0.794
Secondary	3.8 (0.8–17.0)	0.086
Tertiary	1.5 (0.3–7.3)	0.645
How likely do you think you will get COVID-19 in future?		
Not at all	Reference	
Slightly	3.3 (0.7–15.5)	0.131
Moderate	1.4 (0.2–9.7)	0.729
Very likely	1.5 (0.3–6.7)	0.612
Extremely likely	1.7 (0.2–13.8)	0.608

(continued)

Table 5. (continued)

Variables	AOR (95% CI)	*p*
Overall, how worried are you about coronavirus?		
Not at all	Reference	
Not very	1.1 (0.1–10.3)	0.935
Somewhat	2.6 (0.3–22.8)	0.396
Very	1.7 (0.2–11.9)	0.610
To what extent do you think coronavirus poses a risk to you personally?		
No risk at all	Reference	
Minor risk	0.4 (0.1–2.8)	0.381
Moderate risk	1.7 (0.2–11.8)	0.586
Major risk	0.7 (0.1–5.1)	0.707
I think I have some immunity to coronavirus		
Strongly disagree	Reference	
Disagree	0.3 (0.0–2.1)	0.232
Neutral	0.0 (0.0–0.3)	0.003
Agree	0.0 (0.0–0.4)	0.005
Strongly agree	0.0 (0.0–0.4)	0.019
Have you been hesitant to have your children vaccinated?		
No	Reference	
Yes	0.1 (0.0–0.6)	0.016
Have you ever refused to have your children vaccinated?		
No	Reference	
Yes	1.2 (0.1–13.0)	0.902
Have you ever received or heard negative information about COVID-19 vaccination?		
No	Reference	
Yes	0.5 (0.2–1.5)	0.242
AOR, adjusted odds ratio; CI, confidence interval.		

with our findings in the medical student population ,where male students were up to two times more likely to accept the COVID-19 vaccine. Among healthcare workers in Democratic Republic of Congo, males were also more likely to receive the vaccine.[16] This trend has been observed in Kuwait,[17] the general population in the United States,[18] and their health workers.[19] It is not yet clear as to why this gender difference has been continually reported in previous studies as well.[20] Men have been reported to generally take more risks in life than women. With the ongoing infodemic of antivax messages, we postulate that men may be willing to take a risk and

receive the vaccine, hence the difference in acceptability.

Our study also demonstrated the impact of perceived immunity to the COVID-19 vaccine on its acceptability. Those who thought they had immunity towards COVID-19 were significantly less likely to accept the vaccine. This perception has been reported in the general population of Kuwait adults,[17] where self-perceived risks of contracting COVID-19, the self-perceived potential severity of their COVID-19 and perceptions on natural immunity towards COVID-19 affected acceptability in a similar trend. There is therefore need to provide clear information about development of immunity among patients who have previously had COVID-19, and intensifying risk communication to curb the reluctance observed in the general public in Uganda with regard to COVID-19 prevention.

Despite the proven efficacy of COVID-19 vaccines, breakthrough SARS-CoV-2 infection might still occur despite a complete vaccination.[21] Therefore, COVID-19 vaccine recipients should be reminded to continue other personal preventive measures to reduce SARS-CoV-2 transmission, such as masking and physical distancing when in public or around unvaccinated individuals who are at risk for severe COVID-19.[22]

There is growing concern that vaccine hesitancy and anti-vaccination presence will dampen the uptake of the coronavirus vaccine. There are many cited reasons for vaccine hesitancy. Mercury content, autism association, concerns about vaccine side effects and safety, lack of trust in the process and vaccine danger have been commonly found in anti-vaccination messages.[23] In other studies, COVID-19 vaccine hesitancy has been associated with younger age (e.g. <60 years old), self-identification as Black race, lower levels of education, lack of health insurance, sex, education, employment, income, having children at home, political affiliation and the perceived threat of getting infected with COVID-19 in the next 1 year.[10–12,14] In the present study, we noted that individuals who perceived to have some immunity to COVID-19 were less likely to accept the vaccine.

Our study has some limitations. We had a small sample size and derived the study population from a single center. Therefore, our findings may not be generalizable to the general population of high-risk individuals in Uganda. However, our findings provide a useful information on potential strategies to optimize vaccine uptake among these high-risk populations. Future research work would be tailored at the actual uptake and completion of vaccination schedules in this population.

In conclusion, among high-risk individuals in Uganda, willingness to accept the COVID-19 vaccine was high. Target health communications aimed at addressing barriers to vaccine uptake has to be prioritized in this population.

ORCID iDs
Felix Bongomin [iD] https://orcid.org/0000-0003-4515-8517

Ronald Olum [iD] https://orcid.org/0000-0003-1289-0111

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