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AWARENESS, PERCEPTIONS AND ACCEPTABILITY OF THE COVID-19 VACCINE IN BUGIRI DISTRICT: A CROSS-SECTIONAL STUDY.

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Abstract

Background:

Globally, COVID-19 vaccine uptake's been hampered by misperceptions and conspiracy theories. We investigated people's awareness, perceptions and acceptability of the COVID-19 vaccine in Bugiri district.

Methods:

This was a cross-sectional study among COVID-19 unvaccinated adults aged 18 and above. Data were collected in October and November 2021. Data were collected on people's awareness, perceptions, and willingness to accept the vaccine if availed freely. 'Acceptability of the COVID-19 vaccine' denoted people's willingness to accept to take the vaccine if offered to them free of charge. We used an interviewer-administered, pilot-tested, structured questionnaire loaded on a mobile phone to collect data from 465 respondents. Data were analyzed using STATA version 15.0.

Results:

Of 465 respondents, 59.05% (n=274) were aged 18-35 years; 52.80% (n=245) were male; 68.97% (n=320) were married; while 68.75% (n=319) attained primary education. Overall, awareness about the COVID-19 vaccine was nearly universal (95.04%, n=441), with no marked difference between males and females. We found favorable perceptions towards the COVID-19 vaccine, with slightly more than three-quarters (76.72%, n=356) agreeing with the statement that people should be willingly vaccinated against COVID-19. When asked about their willingness to accept the COVID-19 vaccine, 60.78% (n=282) reported that they would be willing to accept the vaccine if it was to be given to them free of charge, with a higher of males (75.80%, n=166) indicating that they would be willing to accept the vaccine than their female counterparts (60%, n=147).

Conclusion:

Awareness was nearly universal and respondents had favorable perceptions towards the COVID-19 vaccine. Only six in ten participants would accept the COVID-19 vaccine if availed to them free of charge. Findings suggest increased access to improve uptake.

Recommendation:

Our study findings suggest efforts should be geared towards increasing access to vaccines while reducing associated costs in order to improve acceptance.

Keywords: COVID-19 vaccine, Awareness, Perceptions, Hypothetical Acceptability, Submitted: 2023-07-04 Accepted: 2023-07-07

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1. BACKGROUND

Uganda registered its first COVID-19 case on March 20, 2020. Since then, the cumulative number of COVID-19 cases kept rising and reached 169,473 as of November 08, 2022. Of these, a total of 3,630 people have since died of COVID-19[1]. Despite this increasing number of COVID-19 cases in Uganda, uptake of COVID-19 preventive measures remains low at 22.2% for the use of face-masks, 40.9% for the use of hand-washing with soap and water while social distancing is practiced among 17.6%[2]. This low uptake of COVID-19 prevention measures means that Ugandans are at an increased risk of acquiring and transmitting COVID-19 if no effort is made to enforce the adoption of the recommended prevention measures. To avoid the situation from getting out of control, it was necessary to vaccinate the population against COVID-19 with an aim of at least 80% coverage so as to trigger herd immunity.

Uganda controlled the local transmission through lockdown: and massive testing of people in quarantine, at the country's boarders and their contacts in addition to Public Health campaigns[3]. The political season and funerals demonstrated a serious breach of the COVID-19 guidelines and the majority of Ugandans survived the disease by some form of luck. It was all evident that a COVID-19 vaccine was required before the situation went out of hand. According to Africa news [4], Uganda received 500,000 doses of Moderna but only utilized 100,000 doses of the vaccine leaving 400,000 doses to go to waste. Less than half of the target of vaccinating 22 million Ugandans above age 18 was met. Over 279 doses of the unused vaccines were AstraZeneca which had expired.

Vaccines can be great at preventing one from getting sick, while at the same time not necessarily stopping one from getting infected or spreading the germ. Preliminary evidence seems to suggest the COVID-19 vaccines make it less likely someone who is vaccinated will transmit the corona virus, but the proof is not yet ironclad. Unvaccinated people should still be diligent about mask-wearing, physical distancing and other precautions against COVID-19[5]. Indeed, it is only after performing some kind of diagnosis that one can offer practical solutions to the problem. And in the case of the peasant population of Nabukalu sub-county who are demonstrating the highest vaccine hesitancy (2.3% uptake of the COVID-19 vaccine) in Bugiri district (A. Abraham, personal communication), identifying the level of knowledge, perceptions, and hypothetical acceptability of the COVID-19 vaccine are the very first steps in addressing the problem.

Without doubt, therefore, COVID-19 is a serious problem for many individuals in Uganda which will affect the future of many people. Hence, it is precisely in this context that the researcher aims to identify the level of knowledge, perceptions, and hypothetical acceptability of the COVID-19 vaccine. In particular, the adult population (18 and above) who hadn't been vaccinated against COVID-19 in Bugiri district was studied. This study, therefore, assessed the awareness, perceptions, and hypothetical acceptability of the COVID-19 vaccine in order to inform policy and streamline health promotion in Bugiri district.

2. METHODS

2.1. Study site

The study was conducted in Bugiri district. Bugiri district was selected because it is among the districts in the Eastern Region of Uganda worst affected by the COVID-19 pandemic; already suffering the consequences of the second wave of the pandemic with 151 cases under Home Based Care (HBC) (MOH,2021) as of August 8,2021. Bugiri has two counties namely; Bukooli north and Bukooli Central, and 12 sub-counties: of these, only one sub-county was selected purposely based on the lowest Uptake of the COVID-19 vaccine. In this case Nabukalu sub-county served as the study area. Bugiri deserved to serve as a study district because it is a boarder district which already has registered 169 COVID-19 confirmed cases and

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seven deaths as of August 8, 2021. There was a low level of the COVID-19 vaccine uptake in the district with Nabukalu sub-county demonstrating to have the least uptake (2.3%)of the vaccine (A. Abraham, personal communication). Nabukalu sub-county has a population of 49,066 people and comprises of 9 parishes and 52 villages (M. Kwemboy, personal communication).

2.2. Study design

The study was an observational descriptive cross-sectional survey. The reason for the selection of this research design was: it could be used to describe characteristics that exist in a community; this method was often used to make inferences about possible relationships; it prompted further study; data could be collected on knowledge, perceptions and hypothetical acceptability of the COVID-19 vaccine variables to see how differences in sex, age, educational status, and income correlated with them; and it's inexpensive and fast. Given the challenge of the COVID-19 outbreak in Uganda, questionnaires of the study were shared onto the smart phones of the research assistants who conducted face-to-face research while following the Standard Operating Procedures (SOPs) of COVID-19.

2.3. Study population

The study population was the adult population (18 years and over) ofNabukalu sub-county in Bugiri district who hadn't yet been vaccinated against COVID-19. All adults in Nabukalu sub-county aged 18 years and above, in a sound state of health, but who were not yet vaccinated against COVID-19 were included. Any adult aged 18 and above, who was unvaccinated at the time of the study, but who was not willing to provide informed consent was excluded.

At the time of the study, 17,810 people of Nabukalu sub-county aged 18 years and above hadn't been vaccinated against COVID-19 (N. Joan, personal communication); and were, hence, eligible for the study.

2.4. Sample size

A sample of 465 respondents was selected which included adults (18 years and over) identified by their gender i.e. male and female, the Ugandan ethnicity, occupation and income, family type, marital status and level of education. The sample size was derived using the Kish Leslie (1964),

Where; z^2 is the standard normal deviate of 1.96 (95% confidence interval)

p= hypothetical acceptability of the COVID-19 vaccine. Since no prior study had been done in this population, we assumed 'p' to be equal to 0.5.

= level of precision (+/- 5%)

$$n = \frac{1.96^2\ 0.5(1-0.5)}{(0.05)^2} = 384$$

Considering a likely non-response rate of 21% based on a high level of anticipated non-response in the community, a sample size of 465 was derived.

2.5. Sampling procedures

A multi-stage sampling process was used to select parishes, villages, households, and individuals who were interviewed for this study. In stage 1, a list of all the nine parishes in the Nabukalu sub-county was generated and assigned numbers consecutively, from which six parishes were selected at random using random numbers. In stage 2, a list of all 35 villages in each of the six parishes was generated and assigned numbers consecutively, from which 18 villages were selected at random using random numbers. In stage 3, a list of households was generated from every village and only 10 households were selected at random using random numbers. Within each household, we interviewed the household head or anyother responsible adult to find out if any members had not yet been vaccinated against COVID-19. If a household had all its members already vaccinated, we moved to the next available household on the list, and this process was continued until we had attained the required number of households. If a household had only one person who had never been vaccinated against COVID-19, that person was screened for study eligibility and if eligible, they were invited to participate in the interview.

If there were many eligible persons in the household, these people's names were written on pieces of paper, each with a number, and one person was selected at random using a lottery method. New households were selected from the original list of households to replace households that did not have any eligible participants until all the eligible participants had been identified and interviewed.

2.6. Study variables

The dependent variable was the acceptability of the COVID-19 vaccine, assessed hypothetically. Independent variables included: socio-demographic characteristics (these included: age, sex, educational level, occupation, family type, and monthly income), knowledge about the COVID-19 vaccine, and perceptions about the COVID-19 vaccine.

2.7. Data collection procedures and methods

Data were collected in October and November 2021. Before data collection, all respondents were screened for eligibility and study-eligible respondents were read a written informed consent form to which they were asked to sign or append their thumbprint (if illiterate) to indicate their consent to participate in the study. Eligible respondents were administered a structured, researcher-developed questionnaire, by trained research assistants using a smartphone (Additional file 1). The questionnaire was developed borrowing closely from the work of 6,7. Research assistants accessed the questionnaire on their smartphones using Epi-collect software and interviewed participants face-to-face while adhering to COVID-19 Standard Operating Procedures. Data were collected on the level of knowledge of the COVID-19 vaccine, perceptions about the COVID-19 vaccine, and willingness to accept the vaccine if it was availed to them free of charge. The level of knowledge on the COVID-19 vaccine was assessed using a combination of dichotomous and semantic (open-ended questions) scales. For instance, respondents were asked if they had ever heard that there was a vaccine for COVID-19 and who was meant to take the COVID-19 vaccine. COVID-19 perceptions on the COVID-19 vaccine were assessed by reading out a se- ries of statements with COVID-19 vaccine-related perceptions to the respondents and asking them to indicate their level of agreement or disagreement using a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. Willingness to accept the COVID-19 vaccine was assessed by reading out a series of COVID-19 vaccine-related statements to the respondents and asking them to indicate their level of acceptance or unacceptable to take the COVID-19 vaccine using a 7-point Likert scale ranging from 1=very unacceptable to 7=very acceptable. Data collection took approximately 10 minutes.

2.8. Ensuring the validity and reliability of the questionnaire.

Research Assistants were trained for 2 days. The training covered knowledge, perceptions, and hypothetical acceptability of the COVID-19 vaccine. At the end of the training, the Research Assistants pilot-tested the study questionnaire in a neutral village of Nabukalu sub-county to review the flow of questions and measure the extent to which the tool would obtain correct data from a population with similar characteristics as the study population. Issues identified through the pilot-testing exercise were resolved through debriefing meetings held after the exercise. To ensure consistency of scale items within the survey, Cronbach's alpha was used for item scores with a range of values including Likert scales.

2.9. Measurement of variables.

The primary outcome was acceptability of the COVID-19 vaccine defined as the people's willingness to accept a COVID-19 vaccine if it was availed to them free of charge. There wasn't any vaccine with the study team; so participants were asked if they would be willing to accept a COVID-19 vaccine if it was brought to them. A 7-point Likert scale from 1= very unacceptable to 7=very acceptable was used to measure this. Knowledge of the COVID-19 vaccine was defined as what

an individual knew about the COVID-19 vaccine. Knowledge of the COVID-19 vaccine was assessed using a series of questions such as: a) are you aware of the existence of a COVID-19 vaccine? b) are you aware of at least one COVID-19 vaccine type? or c) are you aware of the COVID-19 vaccine eligibility criteria? Perceptions about the COVID-19 vaccine were defined as what an individual concluded in their minds regarding the COVID-19 vaccine which could be wrong or correct. A 5-point Likert scale from 1=strongly disagree to 5= strongly agree was used to measure this. To assess perceptions, we asked questions like: a) do you think the COVID-19 vaccine gives total protection against COVID-19? b) do you think the COVID-19 vaccine reduces the severity of COVID-19? or c) Do you think the COVID-19 vaccine is Satanic, d) do you think the COVID-19 vaccine causes side effects?

2.10. Data analysis

Data were uploaded by the research assistants onto the Epi-collect 5 dashboard hosted freely on the Google website which later was downloaded and imported into the Microsoft Excel sheet for cleaning and STATA 15.0 for analysis. Descriptive statistics were computed to generate frequencies and proportions of the population about knowledge, perceptions, and hypothetical acceptability of the COVID-19 vaccine.

2.11. Bias control

To control bias, all adults aged 18 years and above in Nabukalu Sub-county who were in a sound state of mind and hadn't been vaccinated against COVID-19 were considered eligible for the study. Moreover, multistage sampling was used to determine the sample size. In the first stage, 6 out of the 9 parishes were selected; in stage 2, 18 villages were selected; and in stage 3, only 10 households were sampled from each selected village using simple random sampling. In addition, the eligible persons who were contacted three times, but failed to respond were excluded from the study. To minimize recall bias, the recall period was limited to 3 months while to minimize information bias interview information was correlated with some documents like vaccination cards. Also, individual interviews were conducted in private places to minimize information bias.

3. RESULTS

3.1. Eligibility

At the time of the study, Nabukalu Sub-county had the least uptake (2.3%) of the COVID-19 vaccine in the Bugiri district (A.Abraham, personal communication). During the study period, 17,810 people of the Nabukalu sub-county were aged 18 years and above and hadn't been vaccinated against COVID-19 (N. Joan, personal communication); and were, hence, eligible for the study. The sampled participants were 465. All of the 465 participants were enrolled. The response rate for the study was 100%.

3.2. Respondents' Socio-demographic Characteristics.

Table 1 shows the characteristics of the respondents. The majority of the respondents were aged 18-35 years (59.05%, n=274) followed by those aged 36-45 years (19.18%, n=89). There were more males (52.80%, n=245) than females (47.20%, n=219). The majority of the respondents were married (68.97%, n=320) followed by those who were single (25.65%, n=119), cohabiting (4.31%, n=20), and divorced (1.08%, n=5) in that order. Slightly more than two-thirds (68.75%, n=319) of the respondents had attained primary level of education followed by those who had attained secondary education (25.65%, n=119). Ninety-five percent of the respondents (94.61%, n=439) earned a monthly salary while 5.39% (n=25) earned a daily wage.

3.3. Awareness of the COVID-19 vaccines.

Table 2 shows the respondents' awareness of the COVID-19 vaccine, stratified by the respondent's sex. Overall, 95.04% (n=441) were aware of the existence of a COVID-19 vaccine, with no marked difference between males and females. Nearly 95% (n=439) of the respondents were aware of at least one COVID-19 vaccine, with similar proportions

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Original article

Table 1: **Shows the characteristics of the respondents.**

CHARACTERISTICS	CATEGORY	FREQUENCY	PERCENTAGE (%)
Age	18-35	274	59.05
	36-45	89	19.18
	46-55	57	12.28
	Above 55	44	9.48
Sex	Male	245	52.80
	Female	219	47.20
Marital status	Single	119	25.65
	Married	320	68.97
	Cohabiting	20	4.31
	Divorced	5	1.08
Education level	Primary	319	68.75
	Secondary	119	25.65
	University	13	2.80
	Tertiary institute	13	2.80
Income type	Monthly salary	439	94.61
	Daily wage	25	5.39

among males and females. Nearly 91% (n=420) of respondents were aware of the COVID-19 vaccine eligibility criteria, with a slightly higher proportion of males (91.47%, n=258) reporting that they were aware of the COVID-19 vaccine eligibility criteria than their female counterparts (89.32%, n=206). Eighty-seven percent (n=405) of the respondents reported that they were aware of at least one COVID-19 vaccination site in the community, with a higher proportion of males (90.57%, n=318) reporting that they were aware of at least one COVID-19 vaccination site in the community than their female counterparts (80.14%, n=146).

Approximately 82% (n=379) of the respondents were aware of the right number of doses, with a higher proportion of males (91.47%, n=258) reporting that they were aware of the right number of doses than their female counterparts (89.32%, n=206). Furthermore, 80.82% (n=375) of respondents were aware of the right route of administration of the COVID-19 vaccine, with similar proportions among males and females. However, only 36.21% (n=172) were aware of the action of the COVID-19 vaccine in the body, with a slightly higher proportion of females (40.2%, n=80) reporting that they were aware of the action of the vaccine in the body than their male counterparts (33.59%, n=88).

3.4. Perceptions about the COVID-19 vaccine.

Table 3 shows the perceptions about the COVID-19 vaccine by sex. Overall, 76.72% (n=356) of respondents agreed with the statement that people should be willingly vaccinated against COVID-19, with a higher proportion of females (73.39%, n=218) than their male counterparts (70%, n=280). Similarly, 74.57% (n=346) respondents disagreed with the statement that people should be forcefully vaccinated against COVID-19, with a higher proportion of males (78.81%, n=236) disagreeing with this statement than their female counterparts (65.04%, n=246). Seventy-three percent (n=338) of the respondents disagreed with the statement that the COVID-19 vaccine causes serious side effects, with a higher proportion of females (79.59%, n=196) disagreeing with this statement than their male counterparts (70.54%, n=258). Sixty-four percent (n=296) of the respondents disagreed with the statement that taking the COVID-19 vaccine couldn't save one from COVID-19, with a

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Original article

Table 2: **Awareness of the COVID-19 vaccines by sex**

VARIABLE	TOTAL		SEX			
	YES (n, %)	NO (n, %)	FEMALE		MALE	
			YES (n, %)	NO (n, %)	YES (n, %)	NO (n,%)
Aware of COVID-19 vaccine	441(95.04%)	23(4.96%)	191(94.55%)	11(5.45%)	250(95.42%)	12(4.58%)
Aware of at least one vaccine type	439(94.61%)	25(5.39%)	194(94.17%)	12(5.83%)	245(94.96%)	13(5.04%)
Aware of COVID-19 vaccine eligibility criteria	420(90.51%)	44(9.4%)	184(89.32%)	22(10.68%)	236(91.47%)	22(8.53%)
Aware of right number of doses	379(81.68%)	85(18.32%)	164(79.61%)	42(20.39%)	215(83.33%)	43(16.67%)
Aware of at least one COVID-19 vaccination site in the community	405(87.28%)	59(12.72%)	117(80.14%)	29(19.86%)	288(90.57%)	30(9.43 %)
Action of COVID-19 vaccine in the body	172(36.21%)	292(63.79%)	80(40.20%)	122(59.80%)	88(33.59%)	174(66.41%)
Aware of right route of administration of the COVID-19 vaccine	375(80.82%)	89(19.18%)	178(82.02%)	39(17.98%)	197(82.08%)	50(17.92%)

higher proportion of females (68.88%, n=196) disagreeing with this statement than their male counterparts (62.40%, n=258).

Surprisingly, however, 44.83% (n=208) of the respondents agreed with the statement that the COVID-19 vaccine is satanic; higher among males (45.35%, n=117) than their female counterparts (41.33%, n=81). Only 45.69% (n=212) agreed with the statement, 'taking the COVID-19 vaccine means [that] I can get COVID-19 but the disease will be less severe'; higher among males (46.12%, n=119) than their female counterparts (42.35%, n=83).

Student's Journal of Health Research Africa
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Original article

3.5. Acceptability of the COVID-19 vac- cine.

Table 4 shows the acceptability of the COVID-19 vaccine by socio-demographics. Overall, 60.78% (n=282) of respondents were willing to accept a COVID-19 vaccine if it was to be given to them free of charge. A higher proportion of males (75.80%, n=166) than females (60%, n=147) reported that the COVID-19 vaccine was acceptable or very acceptable to them. The proportion of respondents who reported that the COVID-19 vaccine was acceptable or very acceptable to them increased with increasing age

Table 3: **Perceptions about the COVID-19 vaccine by sex.**

VARIABLE	TOTAL (DISAGREE) (n, %)	(AGREE) (n, %)	FEMALE (DISAGREE) (n,%)	(AGREE) (n,%)	MALE (DISAGREE) (n,%)	(AGREE)n,
Perceptions about the vaccine						
Taking a COVID-19 vaccine can't save you from COVID-19	296(63.79%)	168(36.21%)	135(68.88%)	61(31.12%)	161(62.40%)	97(37.59%)
Taking the COVID-19 vaccine means I can get COVID-19 but the disease will be less severe	252(54.31%)	212(45.69%)	113(57.65%)	83(42.35%)	139(53.88%)	119(46.12%)
The COVID-19 vaccine is satanic	256(55.17%)	208(44.83%)	115(58.67%)	81(41.33%)	141(54.65%)	117(45.35%)
The COVID-19 vaccine causes serious side effects	338(72.84%)	126(27.16%)	156(79.59%)	40(20.41%)	182(75.97%)	76(24.03%)
Approaches to vaccination						
People should be willingly vaccinated against COVID-19	108(23.28%)	356(76.72%)	58(26.61%)	160(73.39%8)	4(30%)	196(70%)
People should be forcefully vaccinated against COVID-19	346(74.57%)	118(25.43%)	160(65.04%)	86(34.96%)	186(78.81%)	50(21.19%)

from 58.95% (n=164) among those aged 18-35 years to 78.95% (n=45) among those aged 46-55 years and 86.36% (n=38) among those above 55 years of age.

Acceptability of the COVID-19 vaccine was higher among the divorced and currently married than those who were single or cohabiting. Hypothetical acceptability of the COVID-19 vaccine increased with increasing levels of education from 65.51% (n=209) among those with primary education to 76.92% (n=10) among those with University education and 92.13% (n=12)

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among those with tertiary institute level of ed- ucation. However, hypothetical acceptability was lower among those who earned a monthly salary but was higher among daily wage earners.

Table 5 shows the acceptability of the COVID-19 vaccine by selected vaccine-related qualities and other aspects, stratified by sex. As shown, willingness to accept the COVID-19 vaccine was high if it was procured by the Ministry of Health (98.06%, n=455) or recommended by interna- tional organizations such as the World Health Or- ganization (70.69%, n=328), with almost similar

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Original article

Table 4: **Acceptability of the COVID-19 vaccine by socio-demographics**

	Category	Frequency	Very Unacceptable	Unacceptable	Somewhat Unacceptable	Neutral	Somewhat Acceptable
Overall	All	465	13	114	2	8	14
Sex	Male	245	8(3.27%)	80(32.65%)	1(0.41%)	1(0.41%)	8(3.27%)
	Female	219	5(2.28%)	34(15.53%)	1(0.46%)	7(3.20%)	6(2.74%)
	18-35	274	8(2.92%)	84(30.66%)	2(0.73%)	8(2.92%)	8(2.92%)
Age-group	36-45	89	1(1.12%)	20(22.47%)	0(0.00%)	0(0.00%)	2(2.25%)
	46-55	57	2(3.51%)	7(12.28%)	0(0.00%)	0(0.00%)	3(5.26%)
	Above 55	44	2(4.55%)	3(6.82%)	0(0.00%)	0(0.00%)	1(2.27%)
	Single	119	4(3.36%)	30(25.41%)	1(0.84%)	6(5.04%)	5(4.20%)
Marital status	Married	320	7(2.19%)	79(24.69%)	1(0.31%)	2(0.63%)	7(2.19%)
	Cohabiting	20	2(10%)	5(25.00%)	0(0.00%)	0(0.00%)	2(10.00%)
	Divorced	5	0(0%)	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)
	Primary	319	6(1.88%)	93(29.15%)	1(0.31%)	0(0.00%)	10(3.13%)
Education level	Secondary	119	7(5.88%)	20(16.81%)	1(0.84%)	6(5.04%)	3(2.52%)
	University	13	0(0.00%)	1(7.69%)	0(0.00%)	2(15.38%)	0(0.00%)
	Tertiary institute	13	0(0.00%)	0(0.00%)	0(0.00%)	0(0.00%)	1(7.69%)
Income type	Monthly salary	439	11(2.51%)	114(25.97%)	2(0.46%)	7(1.59%)	13(2.96%)
	Daily wage	25	2(8.33%)	0(0.00%)	0(0.00%)	1(4.17%)	1(4.17%)

proportions between females and males. Willingness to accept the COVID-19 vaccine was also high if it was recommended by health workers (62.72%, n=291). There were no marked differences between males and females in the levels of willingness to accept the vaccine if recommended by health workers but a smaller proportion of males were willing to accept the vaccine if recommended by health workers (62.14%, n=151) than their female counterparts (67.96%, n=140).

4. DISCUSSION

Our study of 465 unvaccinated Ugandans in Bugiri District shows three important findings: a) awareness of the COVID-19 vaccine was nearly universal; b) nearly three-quarters of the respondents agreed that people should be willingly vaccinated against COVID-19 and c) six out of every ten respondents reported that they would be willing to accept the COVID-19 vaccine if it was given to them free of charge. Females were more likely to be willing to accept the COVID-19 vac- cine than males even though males were more aware of the COVID-19 vaccine attributes (e.g. number of doses, vaccine eligibility criteria, and awareness of vaccination sites in the community) than their female counterparts. Our findings show that willingness to accept the vaccine was higher if the vaccine was procured by the Ministry of Health or recommended by international organi- zations such as the World Health Organization or by health workers. Taken together, these findings imply the need for increasing vaccine acceptabil- ity, increasing vaccine trustworthiness, and devis- ing innovative vaccine promotion interventions to reach men with the COVID-19 vaccine.

4.1. Awareness of the COVID-19 vaccine.

Awareness of the various aspects of the COVID-19 vaccine (at least one type, criteria, number

Table 5: **Acceptability of the COVID-19 vaccine by selected vaccine-related qualities and other aspects by sex**

VARIABLE	TOTAL Accepted (n, %)	Refused (n, %)	SEX Female ACCEPTED (n,%)	Female REFUSED (n,%)	Male ACCEPTED (n,%)	Male REFUSED (n,%)
COVID-19 vaccine has been procured by Ministry of Health	455(98.06%)	9(1.94%)	221(99.10%)	2(0.9%)	234(99.57%)	1(0.43%)
COVID-19 vaccine has been recommended by international organizations such as World Health Organization	328(70.69%)	136(29.31%)	135(72.58%)	51(27.42%)	193(71.48%)	77(28.52%)
COVID-19 vaccine is less popular among politicians	146(31.47%)	318(68.53%)	64(30.48%)	146(69.52%)	77(30.92%)	172(69.08%)
COVID-19 vaccine is less publicized by the media	152(32.76%)	312(67.24%)	57(28.5%)	143(71.5%)	75(30.92%)	169(69.08%)
COVID-19 vaccine has been de-campaigned by religious/cultural leaders	154(33.19%)	310(66.81%)	64(31.07%)	142(68.93%)	84(33.33%)	168(66.67%)
COVID-19 vaccine has been recommended by Health	291(62.72%)	173(37.28%)	140(67.96%)	66(32.04%)	151(62.14%)	92(37.86%)
COVID-19 vaccine has been de-campaigned by traditional healers	118(25.43%)	346(74.57%)	41(20.40%)	160(79.60%)	57(23.46%)	186(76.54%)
Willingness to recommend the COVID-19 vaccine to others						
Willingness to recommend a COVID vaccine to friends and family	318(68.53%)	146(31.47%)	151(73.30%)	55(26.70%)	167(67.34%)	81(32.66%)
Willingness to travel to a COVID vaccination center to be vaccinated	262(56.47%)	202(43.53%)	129(65.15%)	69(34.85%)	133(58.59%)	94(41.41%)
Willingness to pay for the COVID vaccine	74(15.95%)	390(84.05%)	24(11.65%)	182(88.35%)	40(16.13%)	208(83.87%)

of doses, vaccination site in the community, and route of administration) was high (80% or higher). Our study agrees with findings by Abdelhafiz 8 that the most common sources of knowledge concerning COVID-19 were: social media (66%), the internet (58.3%), and TV/Satellite channels (52. 6%). Our study was conducted in a rural setting probably with limited technology access, and limited access to higher education, yet with a populace that was aware of the existence of a COVID-19 vaccine, probably because the COVID-19 vaccine was being gossiped about in the community. This implies that the community members were aware of the availability of the COVID-19 vaccine. A slightly higher proportion of males were aware of the criteria, number of doses, and site in the community. This was probably so because men had more liberty to spend time in peri-urban centers where they could acquire information through gossip, or radio/Television sets than women which they could have accessed in the peri-urban centers. On the other hand, Women according to the cultural traditions were meant to stay home and do house chores. Women could be only meet in their women savings groups and religious/cultural gatherings.

Only 36.21% of the respondents were aware of the action of the vaccine in the body. Our study is in agreement with findings by Kalam9, having university/higher level of education was associated with being aware of the COVID-19 vaccine. In addition, our study also is in agreement with findings from a UK study conducted by Sherman 10. where adequacy of information about the COVID-19 vaccine was associated with intention. Moreover, our study also is in agreement with an Ethiopian study by Berihun 11 which found that participants who had good knowledge of the COVID-19 vaccine would easily accept the COVID-19 vaccine. Furthermore, our findings do agree with findings from a study conducted in the United Arab Emirates which found that people were more likely to be vaccinated against COVID-19 when merits were effectively communicated through government websites and trusted new channels.

Our study findings are in agreement with a study by Solis 12. which found that higher exposure to positive information on social media related to COVID-19 vaccination was associated with higher parental acceptability of COVID-19 vaccination; meanwhile, higher exposure to negative information related to COVID-19 vaccination on social media was negatively associated with higher parental acceptability. Moreover, our findings are not in agreement with an Indonesian study by Faturohman 7) which found that amount of information on COVID-19 didn't significantly affect COVID-19 vaccine acceptance. The reason which could lead to the disagreement with the Indonesian study could be owing to the fact that it deployed the Technology Acceptance Model (TAM) as the framework to decide factors that affected vaccine acceptance which wasn't the case with our study. This implies that few respondents knew about the benefits of the COVID-19 vaccine and how safe the vaccine was in some one's body. Probably, rural people were not receiving clear information on the COVID-19 vaccine, and maybe, access to clear information was probably hard for the rural community members. On the other hand, probably a lot of poor information was being shared amongst themselves given the conspiracy theories and myths about the COVID-19 vaccine that were being gossiped in the villages.

The availability of a clear knowledge gap could lead to vaccine hesitancy. Health education and promotion innovative approaches that target both males and females should be able to reach them with adequate information on criteria, doses, vaccination sites in their communities, benefits of the COVID-19 vaccine, and safety of the vaccine; and this information should reach them in their homes, village gatherings, savings groups, cultural gatherings, religious gatherings, social events, peri-urban centers, media platforms e.g. .WhatsApp, radio, and TV, while facilitating government systems such as the VHTs, Health Assistants and other stakeholders to be able to share with the community members adequate information about the COVID-19 vaccine.

4.2. Perceptions of the COVID-19 vaccine.

Our study found that 46% of the respondents agreed with the statement that 'taking the COVID-19 vaccine means that I can get COVID-19 but the disease will be less severe', higher in males than females. This means that 54% of the respondents failed to agree with the above statement. Our study findings are in agreement with a study by Sherman 10 which found out that COVID-19 vaccine acceptability among the population of the United Kingdom was associated with stronger beliefs about social acceptability of a COVID-19 vaccine, the perceived need for COVID-19 vaccination, weaker beliefs that the vaccine is unsafe, beliefs that only those at serious risk of illness should be vaccinated and that the vaccines were just a means for manufacturers to make money. To add, our study also agrees with a Saudi Arabian study by Alfageeh 13. where participants had stronger intention to receive a COVID-19 vaccine if they believed in mandatory COVID-19 vaccination, or reported high levels of concern about contracting COVID-19. In addition, our findings also agree with a study by Akther 14which found out that belief in conspiracy theory undermines COVID-19 vaccine acceptance, thereby negatively impacting the individual attitudes, subjective norms, and acceptance; perceived usefulness of vaccination and the perceived ease of obtaining the vaccine positively impact attitude and acceptance of immunization; and individuals' positive attitudes toward immunization and constructive subjective norms have a positive impact on vaccine acceptance.

Moreover, our study also agrees with Southeast Asian study by Harapan 6. (2020) where for a 95% effective vaccine, being a health care worker and having a higher perceived risk of COVID-19 infection were associated with a higher acceptance. Our findings also agree with a Vietnamese study by Nguyen 15 which found that the most common reason for refusing COVID-19 vaccination was 'worry about the safety of the vaccine' (66.9%) in Hanoi 'the preventive effect of the COVID-19 vaccine is low' in Ca Mau. Our study also agrees with a Pakistan study by Qamar 16 . (2021) which found that 15% perceived their risk of being infected at 20-30%. Our study findings are also in agreement with an Ethiopian study by Berihun11. which found that participants who had a positive attitude toward the COVID-19 vaccine would easily accept to be vaccinated. Moreover, our study does agree with a study by Solis 12 which found that positive attitude toward COVID-19 vaccination, the perception that a family member would support them in having their children take up COVID-19 vaccination (perceived subjective norm), and perceived behavioral control to have children take up COVID-19 vaccination was associated with higher parental acceptability of COVID-19 vaccination. To add, our study findings agree with findings from a Thailand study by Kitro 17 which found that being a health worker, good compliance to social distancing, accepting serious side effects at level 1 to 100,000, and having a good attitude toward COVID-19 vaccination were associated with vaccine acceptance. Furthermore, our findings are in agreement with an Indonesian study by Faturohman7 which found that high perceived usefulness significantly increased COVID-19 vaccine acceptance and high perceived ease of use significantly increased the perceived usefulness.

Our study implies that the majority of the people in the rural settings perceived that if they received the COVID-19 vaccine, they could get severe COVID-19 and probably die. This means that probably the rural population believed the conspiracy theories about the COVID-19 vaccine such as: the COVID-19 vaccine was un- safe for Africans, the COVID-19 vaccine would start killing African recipients after two years, the COVID-19 vaccine weakened the immune system, the COVID-19 vaccine had no benefits, the manufacturers of the COVID-19 vaccines were after making money, among others-which were being gossiped in the rural areas. This probably indicated that the majority of persons living in the rural areas had a poor perception about the COVID-19 vaccine, and this could contribute to vaccine hesitancy. Health education and health promotion initiatives should target to reach every person living in the rural areas at household level using various innovative approaches, such

the VHT strategy with the supportive supervision of Health Assistants, with an aim to clear any myths and conspiracy theories that people in the rural areas have about the COVID-19 vaccine.

4.3. Acceptability of the COVID-19 vaccine.

Our study found 60.78% would accept the COVID-19 vaccine if available free of charge. The implication is that nearly 39% wouldn't. Our study is in agreement with a study by Chowdhury 18 conducted among the Indian populace where 70.44% showed a willingness to get vaccinated against COVID-19 and 29.55% were hesitant to get vaccinated against COVID-19;63.1% of the Indians were willing to get their children vaccinated against COVID-19; and 59.31% of them felt the vaccine should be free for all. Our study also agrees with a study by Elhadi 19 where 93.1% of the population believed the COVID-19 vaccine should be provided for free and 48.2% were the ones willing to buy it. Our study also agrees with an Indian study by Sharun 20 where 65.8% of the participants responded that they would receive COVID-19 vaccination as soon as possible whenever the vaccine is available. Moreover, our findings are in agreement with findings from a Thailand study by Malik21 which found that acceptance rate was higher among expatriates than local people (57.8% Vs 41.8%); and acceptance rate increased up to 89%-91.3% if respondents could select the vaccine brand, and 80.7%-83.2% when recommended by health care professionals. Our study implies, majority of the people in the rural areas were willing to accept a free COVID-19 vaccine, but nearly one-third of them were not willing, probably due to a poor perception about the COVID-19 vaccine, probably as a result of lack of correct information about the COVID-19 vaccine amongst community members. Health promotion programs should, thus, consider coming up with initiatives that address the poor perceptions about the COVID-19 vaccine that could be causing unacceptance among the nearly one-third of rural populace.

Our study found that acceptance of the COVID-19 vaccine was higher among females than males. Our study is in agreement with findings from a Malaysian study by Solis 12et al. (2021) which found that females were more likely to accept the COVID-19 vaccine as compared to their male counterparts. Moreover, our findings are in agreement with an Ethiopian study by Berihum 11which found that females were significantly associated with willingness to receive the COVID-19 vaccine as compared to their male counterparts. To add, our study, however, is not in agreement with a US study by Malik 21 where males were more willing to accept a COVID-19 vaccine as compared to their female counterparts. Moreover, our findings were in agreement with a physicians' Colombian study by Alvarado22 which found that medical specialty, having never paid for a vaccine, recommending the administration of the COVID-19 vaccine to parents or people over 70 years, and dispensing the vaccine to children were factors for free COVID-19 vaccination with an effectiveness of 60% and 80%. Our study implies that females were more likely to accept the COVID-19 vaccine as compared to males, probably because they were more likely to visit health facilities where they could receive information about the vaccine from health workers as well as the COVID-19 vaccine as compared to their male counterparts.

Meanwhile, our study found that acceptability of the COVID-19 vaccine would be high if the vaccine is procured by Ministry of Health or recommended by WHO or health workers. Our study is in agreement with a US study conducted by Reiter 23 where participants were more likely to get vaccinated if they thought their health care provider would recommend COVID-19 vaccination. To add, our findings are also in agreement with a study conducted in UAE by Ahamed 24 which found that people were more likely to be vaccinated when COVID-19 vaccines are endorsed by trusted government health authorities, and recommended by physicians and family doctors. Moreover, our findings agree with findings from a Saudi Arabian study by Qattan 25 which found that 50.29% would delay until the COVID-19 vaccine safety was confirmed. Our study implies that the people staying in the rural areas could only

accept a COVID-19 vaccine which was endorsed by Ministry of Health and WHO, as well as recommended by the Health workers. This means probably that the people living in the rural areas had trust in Ministry of Health and WHO, as well as the health workers. Health promo- tional programs should avail more platforms to health workers, officials from Ministry of Health and WHO to be able to share correct information about the COVID-19 vaccine inclusive of its benefits and its safety while confronting any myths and conspiracy theories that could trigger vaccine hesitancy.

On the other hand, our study found that 68.53% were willing to recommend the vaccine to family and friends. Our study is in agreement with a US study by Malik 26 where the majority (67%) were willing to accept a COVID-19 vaccine if it was recommended to them by friends and family. Our study findings also agree with a Libyan study by Ahmed 27 where having a family member or friend infected with COVID-19 was positively associated with the likelihood of vaccine acceptance; meanwhile, having a friend or family member who died due to COVID-19 was negatively associated with it. Our study also agrees with a Pakistan study by Qamar16 which found that 70% were willing to be vaccinated against the COVID-19 vaccine that was recommended. Our study implies that COVID-19 vaccine recipients who were family members, friends, doctors /health workers, work mates could easily influence their colleagues who were not yet vaccinated to receive the COVID-19 vaccine. The health promotion programs should consider the innovation of including the vaccinated family members, friends, work mates, and health workers in COVID-19 vaccination campaigns to help convince their colleagues to receive the COVID-19 vaccine.

Furthermore, our study found that the younger population (18-35) was less willing to accept the COVID-19 vaccine. Our study was in agreement with a US study by Malik 26 where older adults (>55years) were more willing to accept a COVID-19 vaccine as compared to younger adults. Our study findings are, however, in disagreement with a study by Elhadi 27 where acceptance of the COVID-19 vaccine was statistically associated with younger age groups, especially 31-40 and 41-50 years. The Libyan study by Elhadi 27, was conducted using convenience sampling technique which could have had limited representativeness. Our study implies that the youth aged 18-35 years were less likely to accept the COVID-19 vaccine as compared to the older counterparts. The health promotion programs should consider to use youth COVID-19 immunization champions to help in mobilization of youth to receive the vaccine. The health promotion programs should as well conduct COVID-19 vaccination campaigns targeting the youth.

5. CONCLUSION.

Our study of 465 unvaccinated Ugandans in Bugiri District shows three important findings: a) awareness of the COVID-19 vaccine was nearly universal; b) nearly three-quarters of the respondents agreed that people should be willingly vaccinated against COVID-19 and c) six out of every ten respondents reported that they would be willing to accept the COVID-19 vaccine if it was given to them free of charge. Willingness to accept the COVID-19 vaccine was higher in females than males despite the fact that males were more aware of the COVID-19 vaccine attributes (e.g. number of doses, vaccine eligibility criteria, and awareness of vaccination sites in the community) than their female counterparts. Our findings show that willingness to accept the COVID-19 vaccine was higher if the vaccine was procured by the Ministry of Health or recommended by international organizations such as the World Health Organization or by health workers. Taken together, these findings suggest a need for increasing vaccine acceptability, increasing vaccine trustworthiness, and devising innovative vaccine promotion interventions to reach men with the COVID-19 vaccine.

6. Study limitations.

Our study had some limitations. The fact that vaccine acceptance was assessed hypothetically. It

is likely that acceptance levels might have been higher or lower than observed if the study team had a vaccine to administer. Thus, the acceptance levels reported in this study might not be comparable to those in studies that actually had the vaccine to administer. However, our findings remain crucial in a country where vaccine coverage is still low and can help to inform vaccine promotional efforts in the country.

7. Strengths.

The strength of our study lies in the fact that this is the first study in Uganda to assess hypothetical acceptability in a fully non-vaccinated population. Although the study was conducted in a rural district, we believe that the findings are generalizable to other rural, non-vaccinated populations and can thus inform government efforts to reach unvaccinated populations in the country. Also, much as the vaccine was assessed hypothetically, research assistants were trained and equipped to collect the required data.

8. Recommendations.

Our study findings suggest efforts should be geared towards increasing access to COVID-19 vaccines while reducing COVID-19 vaccination associated costs in order to improve acceptance of the COVID-19 vaccines.

9. List of abbreviations.

CDC Center for Disease Control and Prevention
CI Confidence Interval
CLA Community Led Action against COVID-19
COVID Corona Virus Disease 2019
DNA De-oxyribose Nucleic Acid
EIA Entebbe International Airport
HBM Health Belief Model
MOH Ministry of Health
OR Odds Ratio
PHEIC Public Health Emergency of International Concern
PPE Personal Protective Equipment
PR Prevalence Rate
RNA Ribose Nucleic Acid
SARS-CoV-2 Severe Acute Respiratory Syndrome –Corona Virus-Type 2
SII Serum Institute of India
SR Saudi Riyal
UAE United Arab Emirates
UNICEF United Nations Children's Emergency Fund.
US United States
VHT Village Health Team

10. Ethics approval and consent to participate.

This study was reviewed and approved by the institutional review board of Makerere University School of Public Health. All respondents provided written informed consent before participation in the study. All study procedures were performed by the ethical standards of the institutional and/or national research committees and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

11. Declaration of Conflict of Interests.

The authors declare no financial or relationship conflict of interest as related to this paper or the data used. Furthermore, this work has never been submitted to any other journal for publication.

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13. Authors' contributions.

JKBM and SW conceived the study; SW and AM conducted data analysis; SW wrote the main manuscript; JKBM reviewed the manuscript for substantial intellectual content. SW revised the

manuscript based on the reviewers' comments. All authors reviewed the manuscript and approved it for submission.

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