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Health professionals' COVID-19 vaccine acceptance and associated factors in Wollega University referral hospital, Western Ethiopia: A cross-sectional study

Tadesse Tolossa[a], Getahun Fetensa[b,c], Diriba Ayala[d], and Bizuneh Wakuma[b]

[a]Department of Public Health, Institute of Health Science, Wollega University, Nekemte, Ethiopia; [b]Department of Nursing, Institute of Health Science, Wollega University, Nekemte, Ethiopia; [c]Department of Health Behavior and Society, Faculty of Public Health, Institute of Health, Jimma University, Jimma, Ethiopia; [d]Department of Midwifery, Institute of Health Science, Wollega University, Nekemte, Ethiopia

ABSTRACT

Background: Health professionals' willingness to accept the COVID-19 vaccine is very important, and evidence suggests that only a limited proportion of health-care workers were ready to accept a COVID-19 vaccine, which is very low when compared with the risk of the disease. This study aimed to assess health professionals' acceptability and associated factors in Wollega University referral hospital, Western Ethiopia.

Methods: An institution-based cross-sectional study was conducted among health-care workers in Wollega University referral hospital from March 26–28, 2021. The data were collected by using a self-administered questionnaire. Epi-data version 3.2 was used for data entry, and STATA version 14 was used for data analysis. The binary logistic regression model was employed to determine factors associated with the acceptability of the COVID-19 vaccine. Adjusted Odds Ratio (AOR) with 95% confidence intervals was computed and statistical significance was declared at a 5% level (*p*-value <.05).

Results: A total of 191 health professionals have participated in the study. The study indicates that 65.4% (95% CI: 58.6%, 72.2%) of health professionals had the willingness to receive the COVID-19 vaccine if available. Age of health professionals (AOR = 3.58, 95% CI: 1.38, 8.38), knowledge of the COVID-19 vaccine (AOR = 2.98, 95% CI: 1.22, 7.23), and perception of COVID 19 vaccine (AOR = 5.71, 95% CI: 2.50, 13.00) were significantly associated with vaccine acceptability.

Conclusions and recommendations: Nearly, two-thirds of health professionals were willing to accept the COVID-19 vaccine, which is low. In general, continuous communication and health education have to be provided to enhance overall awareness of the COVID-19 vaccine.

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Introduction

The COVID-19 pandemic has been resulting in a range of illnesses, from mild symptoms to severe illness and death in recent history. It is still not clear how SARS-CoV-2 will affect each person in which it is mild in some, however, severe and can even cause death in some individuals.[1] It is known that vaccination is one of the most crucial strategies in the control of the pandemic. Currently, available COVID-19 vaccines are being held to the same safety standards as all vaccines.[1,2] Available evidence is suggesting that AstraZeneca is effective in preventing COVID-19 in people aged 18 years and older.[3] Vaccination of health professionals is very crucial as they are on the front lines and at risk of exposure, can potentially transmit the virus that causes COVID-19 to patients, their families, and their communities.[1,3,4] Two doses are indicated to provide the best protection against COVID-19 for both mRNA vaccines in which the first dose primes the immune system, helping it recognize the virus, while the second dose boosts the immune response. Like any other vaccine, it is not free from side effects; minor manifestations are visible, especially after the second dose, which include fever, headache, and muscle ache.[1]

The first batch of COVID-19 vaccines, 2.2 million doses of AstraZeneca, has arrived in Addis Ababa, Ethiopia, on 7 March 2021, through the COVAX facility, a global partnership for equitable and timely access to COVID19 vaccines.[5] Ethiopia reported the highest number of COVID-19 confirmed cases in East Africa. As of 7 March 2021, 166,138 confirmed COVID-19 cases, and 2,429 deaths were recorded in the country. This puts Ethiopia in the fifth position by the number of confirmed cases and in the sixth position by the number of deaths due to COVID-19.[5] Research revealed greater than 67,569 cases of COVID-19 infected HCWs in Ethiopia.[6]

Not all vaccines are a hundred percent protective, so every individual has the possibility of getting sick from COVID-19 after vaccination. It is not known how long the protection from the COVID-19 vaccine AstraZeneca will last after completing the two doses.[3] In Ethiopia, to maximize the public health benefit of the vaccine, the first doses will be prioritized for health and essential workers, and other at-risk and vulnerable groups.[5] The COVID-19 pandemic has brought about an unusual crisis in healthcare as the number of COVID-19 cases has risen unacceptably globally, which include health-care workers (HCWs) infections. The signs and symptoms of the disease were studied in tandem with the rapid development of a vaccine against this fatal disease. Global, sustained efforts have been undertaken by the WHO to limit the spread of infection and improve treatment protocols to decrease morbidity and mortality through available strategies.[7]

CONTACT Tadesse Tolossa yadanotolasa@gmail.com Department of Public Health, Institutes of Health Sciences, Wollega University, P.O.BOX: 395, Nekemte, Ethiopia

Acceptability of vaccination against COVID-19 among HCWs is very important because health professionals' willingness toward vaccine acceptance is a crucial factor as they will take it for their own and their probability of recommending the vaccine to their patients will be increased.[1,2] Evidence is suggesting that only 27.7% of HCWs were ready to accept a COVID-19 vaccine if it was available which is very low when compared with the risk of the disease.[2] Several associated factors were identified so far regarding the willingness of the people to take COVID-19 vaccines; perceived susceptibility, safety (fear of side effects), willingness to pay for the vaccine, history of contracting COVID-19, knowledge regarding COVID-19, sex, occupation, religion, age and marital status.[8–10]

Disclosing information related to the vaccine is very crucial to increasing the acceptability of the vaccine and reducing factors that contributed to the hesitancy of the vaccine of COVID-19 among health professionals.[11,12] It is known that with the risk of COVID-19 reemerges, health professionals can contribute to control it comprehensively, which benefits for better combat COVID-19. However, there is a paucity of research that fully examines the willingness of health professionals toward the COVID-19 vaccine in the study area. Therefore, this study targeted identifying health professionals' readiness for acceptability of the vaccine in WURH.

Methods

Study area and period

This study was conducted at Wollega University referral hospital (WURH). The hospital is found in Nekemte town, Oromia regional state, western Ethiopia. The town was found 331 km to the west of the capital city, Addis Ababa. The study was conducted from March 26–28, 2021 before the distribution of the vaccine. The hospital has around 232 health workers, of which around 20 health professionals were on duty during the study period. Since the occurrence of the pandemic in Ethiopia, this hospital is serving as a treatment center for COVID-19 cases.

Study design

An institutional-based cross-sectional study design was employed.

Population, sample size, and sampling techniques

All health professionals working in WURH were a source population. Health professionals who were not on duty due to different reasons were excluded from the study. All health professionals who were on duty during data collection, and have willing to participate in the study were included in the study. WURH was selected purposely because this hospital has been serving as the only treatment center for COVID-19 among all health institutions found in Nekemte city.

Variables

Willingness to accept the COVID-19 vaccine was the dependent variable of this study. Acceptance of the COVID-19 vaccine is defined as a willingness to the vaccine if it is available.[13] It was assessed by asking the question" Are you willing to accept the approved COVID-19 vaccine if it is available?" If they have a willingness to accept the answer is recorded as "Yes", and if they have no interest to accept, it is recorded as "No". Sociodemographic variables such (as age, sex, marital status, educational level, educational background, religion), medical history (chronic medical disease and previously infected with COVID-19), knowledge toward COVID-19 vaccine, attitude toward covid-19 vaccine, and perception toward COVID-19 vaccine were independent variables of this study. The knowledge of health professionals about COVID-19 vaccine was assessed by five items. Each item contained the category of "Yes" and "No". A correct answer was assigned a "1" point and an incorrect answer was assigned "0" points. The total score ranged from 0 to 5. "Good knowledge" was when the scoring was ≥ mean score and a score below the mean value indicated "poor knowledge" of COVID-19 vaccine.

Ten items were used to assess the attitude of health professionals toward COVID-19 cases. Each item was measured on Likert-scale with a five-point scale (strongly agree, agree, neutral, disagree, strongly disagree) to allow the study participants to express how much they agree or disagree with a particular question. "Favorable attitude" was when the scoring was ≥ mean score and less than mean value was rated as an "unfavorable attitude" toward COVID-19 vaccine. Finally, the perception of participants toward the COVID-19 vaccine was assessed by using five items with the "Yes"/No" category. Respondents who scored greater than or equal to the mean score were grouped to have "good perception" and participants who scored less than mean score were grouped to have "poor perception" toward COVID-19 vaccine.

Data collection techniques and data quality assurance

A questionnaire was developed by reviewing previously published papers. The questionnaires comprised sociodemographic data, medical history, knowledge, attitude, and perception toward the COVID-19 vaccine. The data was collected by using self-administered questionnaires. The questionnaire was given to all health professionals who were present on duty and returned to data collectors after they filled it. The questionnaire was prepared in English, and the content of the questionnaire was explained to them prior to distributing it.

The questionnaire was pre-tested on 5% of participants among health professionals working in Nekemte Specialized hospital. Possible amendments were then made based on the findings. A discussion was held between investigators and data collectors, based on the result of the pretest and accordingly, some amendments were made. One-day training was given to the data collectors about the tool and data collection procedure. Data were checked for completeness, accuracy, clarity, and consistency by the supervisors and principal investigator on a daily basis. Any error or ambiguity and incompleteness were corrected accordingly.

Data management and analysis

Epidata version 3.0 was used for data entry and exported to STATA version 14.0 for further analysis. Descriptive statistics, like frequencies, percentages, mean and standard deviation

were computed. Before analysis, data were cleaned and edited by using simple frequencies and cross-tabulation. Re-categorization of categorical variables and categorization of continuous variables was done. The assumption of the logistic regression model was checked before fitting it to the model. The binary logistic regression model was fitted to determine factors associated with COVID-19 vaccine acceptability. Factors that were associated with the outcome variable at a 20% (P-value ≤.20) significant level in the bivariable logistic regression analysis were included in the multivariable logistic regression analysis. Then, crude and adjusted odds ratios together with their corresponding 95% confidence intervals were presented in the final multivariable logistic regression table. AOR with 95% confidence intervals was computed and statistical significance was declared when it was significant at a 5% level (p-value <.05). Multicollinearity (association between explanatory variables) was checked by correlation matrices, and the model goodness-of-fit test was checked by Hosmer and Lemeshow test.

Results

Socio-demographic characteristics of the health care workers

Of the total participants, 191 health professionals responded to the question yielding a response rate of 90.1%. In this study, more than three-fourth of health professionals were relatively younger, and the proportion of the male participants in this study is more than half of the total participants 142 (59.2%). Half of the health professionals were married and 60% of them were protestant religion followers. One hundred sixty-one (84.3%) of the health professionals were first degree holders and close to half of the participants were Nurses in the profession (Table 1).

Table 1. Socio demographic characteristics of the health professionals in WURH, Nekemte town, Western Ethiopia, 2021.

Variables	Category	Frequency	Percent
Age	<30 years old	142	74.4
	≥30 years old	49	26.6
Sex	Male	113	59.2
	Female	78	40.8
Never married	Never married	87	45.5
	Married	94	49.2
	Separated	7	3.7
	Others	3	1.6
Religion	Muslim	31	16.2
	Protestant	115	60.2
	Catholic	2	1.0
	Orthodox	35	18.3
	Others	8	4.2
Education level	Diploma	23	12.0
	Degree	161	84.3
	Above	7	3.6
Background	Nurses	92	48.2
	Midwifery	24	12.6
	Pharmacy	15	7.8
	Medical Practitioner	17	8.9
	Medical specialty	21	10.9
	MLS	16	8.4
	Others	6	3.3
Previously infected with COVID-19	No	168	88.0
	Yes	23	12.0
Chronic medical illness	No	188	98.4
	Yes	3	1.6

Others** Psychiatry, Anesthesia, Biomedical engineering, Environmental health.

Knowledge of COVID-19 vaccine and its acceptability

In this study, 99 (51.8%) of the respondents know the availability of the COVID-19 vaccine, and 147 (76.9%) did not know the effectiveness of the COVID-19 vaccine. Thirty (15.7%) of the respondent's belief COVID-19 vaccine increase allergic reaction and only 13.6% of the health professionals assume the COVID-19 vaccine protect against a variant of COVID-19 strains. Overall the mean knowledge level of the COVID-19 vaccine was 2.76 and 126 (66.0%) of health professionals had good knowledge of COVID-19 vaccine (Figure 1).

Furthermore, nearly two-third 65.0% (95%CI: 58.6, 72.2) of the health professionals had willing to accept the COVID-19 vaccine as opposed to 35% of health professionals has no intention to accept the COVID-19 vaccine (Table 2).

Attitude and perception toward COVID-19 vaccine

All respondents were asked about their attitudes toward COVID 19 vaccine. Only 20.9% of health professionals agree that the COVID-19 vaccine that is currently used in Ethiopia is also used in the country where the vaccine was discovered. Around 9% of the participants accept the vaccine without any hesitation and only 3.7% agree that the vaccine is safe. Overall, nearly half of the health professionals had a favorable attitude toward COVID-19 vaccine (Table 3).

The perception of health professionals toward COVID-19 was also assessed. Accordingly, 37% of the participants have perceived the COVID-19 vaccine as it is effective, and half of them perceived that the COVID-19 vaccine is compulsory for all health-care workers. Eighty-eight (46.1%) of health professionals perceive the post-vaccine side effect, and only one-fourth of them perceive the presence of more than one type of COVID-19 vaccine. To sum up, the around 60% of the health professionals had a good perception of COVID 19 vaccines (Table 4).

Factors associated with health professional's acceptability of the COVID-19 vaccine

In multivariable logistic regression, a variable such as the age of health professionals, knowledge, attitude, and perception toward COVID 19 vaccine was significantly associated with vaccine acceptability in Nekemte town.

Health professionals who are aged greater than 30 years were 3.58 more likely to accept the COVID-19 vaccine when compared to health professionals aged less than 30 years old (AOR = 3.58, 95% CI: 1.38, 8.38). The odds of accepting the COVID-19 vaccine were 2.98 times higher among health professionals who had good knowledge regarding the COVID-19 vaccine than their counterparts (AOR = 2.98, 95% CI: 1.22, 7.23). The perception of health professionals toward COVID-19 vaccine was one of factors that strongly associated with vaccine acceptability. The odds of accepting the vaccine COVID-19 were 5.71 times higher among health professionals who had a good perception of COVID-19 vaccine as compared to their counterparts (AOR = 5.71, 95% CI: 2.50, 13.00) (Table 5).

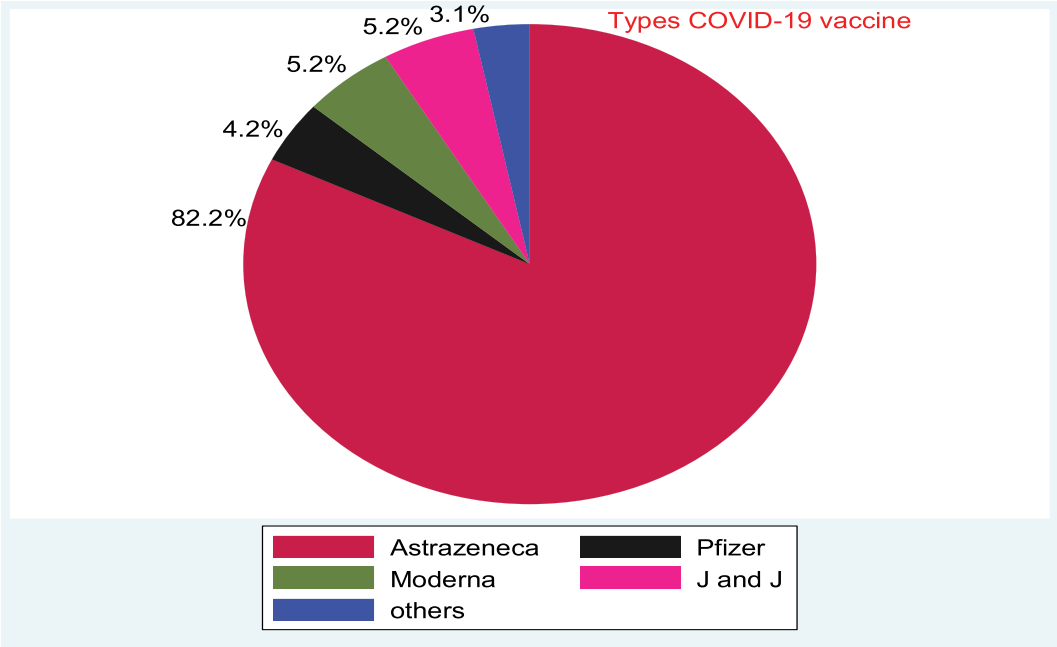

Figure 1. Types of COVID-19 vaccine known by health professionals in WURH, Nekemte town, Western Ethiopia, 2021.

Table 2. Knowledge toward COVID-19 vaccine among health professionals in WURH, Nekemte town, Western Ethiopia, 2021.

Variables	Categories	Frequency	Percent
Do you know about the COVID-19 vaccine availability?	No	99	51.8
	Yes	92	48.1
Do you know about the effectiveness of COVID-19 vaccine?	No	44	23.1
	Yes	147	76.9
Does vaccination increase allergic reactions?	No	30	15.7
	Yes	161	84.3
Do developed vaccine protect against variant strains?	No	26	13.6
	Yes	165	86.4
Will COVID-19 vaccine provide long term protection?	No	24	12.6
	Yes	167	87.4
Knowledge toward COVID-19 vaccine	Good knowledge	126	66.0
	Poor knowledge	65	34.0
Are you willing to accept COVID-19 vaccine?	Yes	125	65.5
	No	66	34.5

Discussion

HCW are first in line for the COVID-19 vaccine as they are the front lines, and have a high risk of exposure and potential to transmit to others.[14] This study was conducted to assess vaccine acceptability and associated factors among health professionals as it is crucial to reduce vaccine hesitancy and improve vaccine coverage which in turn reduces the burden of COVID-19. The study demonstrated that 65% of the health professionals had a willingness to accept the vaccine. This finding shows a lower level of COVID-19 vaccine acceptance, and it might be due to only 1.6% of health professionals having medical comorbidity during the study period. In addition, this finding is comparable with a study conducted in Hong Kong among nurses 63%.[15] The finding of this study is higher than a study in the Democratic Republic of the Congo which reported 27.7%.[16] On the other hand, the finding of the current study is lower than other studies conducted among HCW in France (76.9%)[17] and dental professionals (85%).[7] This discrepancy could be because of the professional variation of the studies as they included different health professionals. The study participants of this study were majorly nurses who are less likely to accept the vaccine than other HCW as evidenced by a previous study.[18] The other possible justification for this variation might be due to the difference in study settings and study period as studies were conducted before the availability of vaccines.

One-quarter of health professionals (20.9%) agreed on the currently used COVID-19 vaccine which is similar to a study conducted on the general population in Addis Ababa.[12] However, this finding is lower than studies conducted in France (72.4%),[19] Greek (78.5%),[20] and seven European countries; Germany (70%), United Kingdom (79%), Denmark (80%), Netherlands (73%) and Portugal (75%).[21] A survey in 19 countries determined the potential acceptance rates of a COVID-19 vaccine reported 71.5% ranging from 90% in China to less than 55% in Russia.[22] This difference may be due to the probability that the studies were conducted before the availability of vaccines. In addition, socioeconomic differences across the study settings may be the other possible reason.

Nearly half of HCW had a favorable attitude toward the COVID-19 vaccine which is supported by a study in France.[19] Health professionals who had a favorable attitude toward the COVID-19 vaccine had a higher acceptance rate of the COVID-19 vaccine. It is supported by a study conducted in the Democratic Republic of the Congo.[16] This finding is in line with a study conducted on the acceptance of the influenza vaccine among Greek HCW.[23] This is because as people perceive vaccines positively, the probability to accept vaccines increases. A study on the acceptability of COVID-19 vaccination among Greek health professionals revealed that the absence of fear over vaccine safety increases vaccine acceptability significantly.[20]

Table 3. Attitude of health professionals toward COVID-19 vaccine in WURH, Nekemte town, Western Ethiopia, 2021.

Variables	Categories	Frequency	Percent
Newly discovered COVID-19 vaccine that is given for Ethiopia is the actual one that the discovered country is using yet.	Strongly disagree	57	29.8
	Disagree	61	31.9
	Neutral	29	15.2
	Agree	40	20.9
	Strongly agree	4	2.0
If one individual is vaccinated it will have great contribution for the other person (society)	Strongly disagree	38	19.9
	Disagree	31	16.2
	Neutral	29	15.2
	Agree	73	38.2
	Strongly agree	20	10.5
The newly discovered COVID-19 vaccine is safe.	Strongly disagree	44	23.0
	Disagree	65	34.0
	Neutral	40	20.9
	Agree	35	18.3
	Strongly agree	7	3.7
I will take the COVID-19 vaccine without any hesitation	Strongly disagree	42	22.0
	Disagree	89	46.6
	Neutral	24	12.6
	Agree	19	9.9
	Strongly agree	17	8.9
I will encourage my family/friends/relatives to get vaccinated	Strongly disagree	39	20.4
	Disagree	56	29.3
	Neutral	35	18.3
	Agree	47	24.6
	Strongly agree	14	7.3
It is not possible to reduce the incidence of COVID-19 without vaccination	Strongly disagree	40	20.9
	Disagree	63	33.0
	Neutral	26	13.6
	Agree	49	25.6
	Strongly agree	13	6.8
"Even though I am a religious man I have probability to be infected and for that I have to take the vaccine"	Strongly disagree	31	16.2
	Disagree	115	60.2
	Neutral	2	1.05
	Agree	35	18.3
	Strongly agree	8	4.2
The way to overcome the COVID-19 Pandemic is mass vaccination	Strongly disagree	29	15.2
	Disagree	42	22.0
	Neutral	35	18.3
	Agree	59	30.9
	Strongly agree	26	13.6
Vaccine was not tested for enough time	Strongly disagree	15	7.8
	Disagree	33	17.3
	Neutral	27	14.1
	Agree	53	27.7
	Strongly agree	63	33.0
We can stop precaution after being vaccinated	Strongly disagree	35	18.3
	Disagree	65	34.0
	Neutral	29	15.2
	Agree	29	15.2
	Strongly agree	33	17.3
Attitude toward COVID-19 vaccine	Favorable attitude	93	48.7
	Unfavorable attitude	98	51.3

Table 4. Health professional's perception toward Covid-19 vaccine in Nekemte town, 2021.

		Yes	No
Perception questions on Covid-19 vaccine		N (%)	N (%)
Do you think that the COVID-19 vaccine is effective?		37 (19.4)	154 (80.6)
Do you think that COVID-19 vaccination is mandatory for health care workers		98 (51.3)	93 (48.7)
Do you think the newly discovered COVID-19 vaccine may have side effects?		88 (46.1)	103 (53.9)
Do you think that if everyone in the society maintains the preventive measures, the COVID-19 pandemic can be eradicated without vaccination?		32 (16.7)	159 (83.2)
Are you perceive that there are several candidate COVID-19 vaccines being developed?		50 (26.2)	141 (73.8)
Do you think the COVID-19 vaccine will be affordable and accessible by the common man?		30 (15.7)	161 (84.3)
Perception toward COVID-19 vaccine	Good perception	114 (59.6)	
	Poor perception	77 (40.4)	

The study revealed that 60% of health professionals had a good perception of the COVID 19 vaccine. Thus, having a good perception regarding the COVID-19 vaccine improves vaccine uptake.[24]

In this study, the age of HCW was an important socio-demographic factor that has a significant effect on COVID-19 vaccine acceptance. An increase in age was associated with an

Table 5. Multivariable analysis of factors associated with acceptance of COVID-19 vaccine among health professionals in WURH, Nekemte town, Western Ethiopia, 2021.

		Acceptance				
Variables	Category	Accepted	Not accepted	COR	AOR	*P*-value
Age	≤30 years	58	84	Ref	Ref	
	>30 years	41	8	3.58 (1.54, 8.10)	3.40 (1.38, 8.38)	.008*
Sex	Male	75	38	Ref	Ref	
	Female	50	28	0.90 (0.49, 1.65)	0.76 (0.37, 1.58)	.476
Educational level	Diploma	14	9	Ref	Ref	
	≥1st degree	111	57	1.25 (0.51, 3.06)	1.34 (0.45, 3.95)	.595
Infected with COVID-19	No	111	57	Ref	Ref	
	Yes	14	9	1.25 (0.51, 3.06)	1.12 (0.39, 3.14)	.828
Knowledge	Good	80	46	1.91 (0.96, 3.78)	2.98 (1.22, 7.23)	.016*
	Poor	45	19	Ref	Ref	
Attitude	Favorable	71	22	2.62 (1.41, 4.89)	3.36 (0.97, 7.11)	.076
	Unfavorable	54	44	Ref	Ref	
Perception	Good perception	84	30	2.45 (1.33, 4.53)	5.71 (2.50, 13.00)	
	Poor perception	41	36	Ref	Ref	<.001*

*Statistical significant association at a *p* value <.05.

increase in vaccination acceptance. This finding is supported by other studies in the Democratic Republic of the Congo,[16] Greek,[20] and France.[25] In addition, a survey in 19 countries[22] and a meta-analysis[26] also suggested that age is significantly associated with acceptance of the COVID-19 vaccine. This is because; an increasing age is associated with a high risk of comorbidities, an increase in risk perception, and a higher probability of the disease being severe.[24]

HCW with good knowledge regarding the COVID-19 vaccine had a higher degree of acceptance of the vaccine. This finding is supported by previous studies; health professionals who received information from trusted sources were more likely to accept the vaccine.[19,20,22] HCW recommendations play an influential role in their patients' vaccination behavior. They provide information to the general public and their patients about the benefit of vaccination. Therefore, addressing knowledge gaps regarding the COVID-19 vaccine is the top priority.

HCW having a good perception of the COVID-19 vaccine was strongly positively associated with vaccine acceptability. A study in India on predictors of acceptance of the COVID-19 vaccine in the general public reported that respondents with high perceived benefits showed higher intention to receive the vaccine and respondents with a high perception of the side effects and barriers to vaccination showed a lower intention to receive the vaccine.[24]

This study is not without some limitations. First, the number of sample size was not optimal as the study was conducted on health professionals. Second, healthy worker survivor bias might be happening due to the number of health professionals were on duty leave when the study was conducted, and this finding could not be truly representative of all health professionals found in this hospital and the general population.

Conclusions and recommendations

Nearly, two-third of health professionals had the willingness to accept the COVID-19 vaccine in WURH, which is low as they are at the highest risk of exposure to the disease and the potential to transmit it to others. Age <30 years, poor knowledge, and poor perception of COVID-19 vaccine negatively affect vaccine acceptability. In general, continuous communication and health education have to be provided to enhance overall awareness and perception of the COVID-19 vaccine.

Abbreviations

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
HCW	Health Care Worker
MLS	Medical Laboratory Science
J and J	Johnson and Johnson
WURH	Wollega University Referral Hospital

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Authors' contribution

TT, GF, BW, and DA were involved in the initial development of the proposal. TT is involved in statistical analysis. TT, and BW were involved in developing the initial drafts of the manuscript. All authors participated in the final preparation of the manuscript and they approved the final draft of the manuscript for submission.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

All data analyzed during this study are included in the manuscript.

Ethical approval and consent to participate

The study was approved and ethical clearance letters were obtained from Wollega University, Institute of Health Science Research Ethics review board. After approval, a permission letter was obtained from the administrative body of the hospital to the respective clinics. Verbal consent was obtained from study participants and the purpose of this study was stated to all participants. Everybody participated voluntarily in this study.

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