ORIGINAL RESEARCH

Acceptance of COVID-19 Vaccine and Determinant Factors Among Patients with Chronic Disease Visiting Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia

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Background: Despite the implementation of different COVID-19 prevention measures, the incidence of the disease continues to rise. Hence, vaccines have been taken as the best option for controlling the transmission of the disease. Although the approved COVID-19 vaccines have proven to be safe and effective, multiple beliefs and misconceptions still exist influencing its acceptance.

Objective: To assess the acceptance of the COVID-19 vaccine and determinant factors among chronic patients visiting Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia.

Methods: Institution-based cross-sectional study design was used among patients with chronic diseases visiting Dessie Comprehensive Specialized Hospital from May 1 to 20, 2021 using a consecutive sampling technique. Binary logistic regression analysis using crude odd ratio (COR) and adjusted odd ratio (AOR) was performed to assess the association between independent and dependent variables. Variables having p values of less than 0.05 at the 95% confidence interval (CI) were considered as factors of COVID-19 vaccine acceptance.

Results: A total of 416 respondents participated in the survey, with a response rate of 98.6%. About 59.4% of the respondents were willing to accept the COVID-19 vaccine. Participants who had health insurance (AOR=1.812; 95% CI: 1.703–3.059), knew anyone diagnosed with COVID-19 (AOR=2.482; 95% CI: 1.427–4.317), having good knowledge of the COVID-19 vaccine (AOR=6.890; 95% CI: 3.900–120.17), and having a positive attitude towards COVID-19 vaccine (AOR=7.725; 95% CI: 4.024–14.830) were factors affecting the acceptance of COVID-19 vaccine.

Conclusion: The acceptance of the COVID-19 vaccine was low. Use of health insurance, knowing anyone who had been diagnosed with COVID-19, knowledge, and attitude towards the COVID-19 vaccine were factors of COVID-19 vaccine acceptance. Healthcare professionals should conduct continuous awareness creation campaigns on the importance of the COVID-19 vaccine, safety, and its efficacy. Further studies like longitudinal and qualitative studies should be conducted to identify additional barriers to vaccine acceptance particularly in high-risk groups.

Keywords: COVID-19, vaccine, acceptance, chronic patients, Ethiopia

Introduction

Coronavirus disease (COVID-19) has caused a global health crisis since December 2019, is caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2).[1–4] The disease was initially reported in China and then declared as a Public Health Emergency of International Concern by the World Health Organization (WHO) on January 31, 2020, and a global pandemic on March 31,

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2020.[5–8] The pandemic has affected 223 countries across the globe[9] and a total of 174,539,625 confirmed cases and 3,756,185 deaths were reported as of June 9, 2021.[10] The first confirmed cases of COVID-19 in Ethiopia was reported on March 13, 2020.[11,12] Since then, a total of 373, 398 confirmed cases of COVID-19 and 4226 deaths were reported as of June 9, 2021.[12]

The COVID-19 pandemic has disrupted the world economy, the health systems, and the quality of life of survivors mainly in developing countries.[13,14] The majority of infections with COVID-19 cause a mild form of infection. But, those elder and people with comorbidities, including cardiovascular, respiratory diseases, and diabetes are five times more likely to have an increased risk of severe illness and death.[15,16] The impacts of COVID-19 on patients with chronic disease are not only restricted on direct effect but also in an indirect manner. Resources at all levels have been shifted away from patients with chronic diseases management and prevention to pandemic management particularly, in low and middle-income countries, including Ethiopia.[17]

The world has implemented different COVID-19 prevention measures, like quarantine, restricted movement, nationwide lockdowns,[15] handwashing with water and soap, keep respiratory hygiene, and use facemask.[18,-20] Despite the implementation of these measures across the world, the burden of the pandemic is not significantly reduced.[1] The health and economic burden of the pandemic prompted the need for timely and effective vaccine development.[14] Hence, vaccination was considered as the best strategy for controlling the transmission of the disease.[1] In May 2020, the 73rd World Health Assembly issued a resolution recognizing the role of extensive immunization as a global public-health goal for preventing, containing, and stopping transmission of SARS-CoV -2. Globally, there are now more than 125 vaccine candidates, 365 vaccine trials ongoing, and 18 vaccines against COVID-19 approved by at least one country.[21] Vaccine plays a vital role in reducing the infection of COVID-19, particularly among high-risk groups such as health care workers, the elderly, and individuals with chronic diseases.[19] The vaccine has been shown to reduce infections even among individuals who are not vaccinated, through the development of herd immunity, if most of the population become vaccinated.[22]

Ethiopian health authorities choose to employ the Astra Zeneca COVID-19 vaccination through the COVAX Facility and Covishield vaccines since March 7, 2021.

Hence, Ethiopia received 2.184 million doses of COVID-19 vaccination. The Ethiopian Ministry of Health officially launched the COVID-19 vaccine at a high-level national event held at Eka Kotebe COVID-19 Hospital, where front-line health workers were vaccinated to kick of the vaccination campaign.[23] Health care professionals (HC), elderly, patients with chronic disease above the age of 55 years old are the prioritized populations for vaccination against COVID-19. Ethiopia has planned to vaccinate only 20% of the population until the end of 2021.[14,24,25]

There is evidence that a significant portion of the population in many countries, may not be willing to get vaccinated against COVID-19.[26] Misinformation and lack of confidence towards vaccines led to low acceptance.[25] Vaccine hesitancy and resistance are major issues around the world, causing the WHO list it among the top ten health risks for 2019.[20,23] Studies have revealed that the acceptance rate of COVID-19 vaccine in the United States of America (USA) 54%,[14] France (71.6%),[27] USA (57.6%),[22] Kuwait (83%),[28] Ethiopia (72.2%),[29] Ethiopia (54.8%),[25] China (84.3%),[30] Saudi Arabia (64.9%),[31] Kenya (61.33%),[32] China (83.5%),[33] Turkey (54%),[34] UK (71.7%),[35] China (91.3%),[36] Ecuador (91%),[37] and France (65.6%).[38]

Studies have also examined factors of willingness to get vaccinated against COVID-19 were perceived risk, sex, race/ethnicity, age vaccine safety, educational level, history of influenza vaccine, professions, vaccination history, religion, visits to high-risk areas, vaccination status of family members, side effects experienced after receiving other vaccines, information-seeking behaviors, trusting healthcare workers, income, adherence to COVID-19 government guidelines, living with children, unforeseen side effects. Perceived benefits, vaccine efficacy, marital status, perceiving a high risk of infection, vaccine price in decision-making, history of COVID-19 test, a high level of worry of contracting COVID-19, and believed that COVID-19 infection can be prevented with a vaccine were factors of COVID-19 vaccine acceptance.[14,22,25,27,28,30,32,33,37–39]

In order to implement the most effective vaccination strategies, the prevalence of and determinant factors of vaccine acceptance are crucial for Government and policy-makers to address all barriers against COVID-19 vaccine acceptance. To date, there has been no prior study on COVID-19 vaccine acceptance among patients with chronic diseases. Therefore, this study was designed to assess the acceptance of the COVID-19 vaccine and

determining factors among patients with chronic diseases visiting Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia from May 1–20, 2021.

Methods
Study Design, Period, and Setting
Institution-based cross-sectional study design was conducted among 416 patients with chronic diseases who have visited Dessie Comprehensive Specialized Hospital from May 1–20, 2021. Dessie town is located in South Wollo Zone, Amhara region, Northeastern Ethiopia. The town is located in a mountainous setting, 401 kilometers north of Addis Ababa and 480 kilometers from Bahir Dar, the capital city of the Amhara Region. According to the record of the Health Management Information System of Dessie Comrhensive Specialized Hospital, more than 25,000 patients with chronic diseases were registered and attending in the hospital.

Populations of the Study
The source population of the study was all patients with chronic diseases who had visited Dessie Comprehensive Specialized Hospital, whereas the study population was all patients with chronic diseases who had visited Dessie Comprehensive Specialized Hospital during the data collection time, between May 1 to 20, 2021.

Inclusion and Exclusion Criteria
All patients with chronic diseases who were volunteer to participate were included in the study. Patients with chronic diseases under the age of 18 and those who were unable to respond owing to a severe illness were excluded from the study.

Sample Size Determination and Sampling Technique
The sample size was determined using the single population proportion formula[18]

$$n = \frac{(Z_{\alpha/2})^2 * p(1-p)}{d^2}$$

$Z_{\alpha/2}$ is the standard normal variable value at (1-α) % confidence level (α is 0.05 with 95% CI, $Z_{\alpha/2} = 1.96$), an estimate of the proportion (p) was considered as 50%, and margin of error (d) 5%. To employ the maximum sample size, 50% of the study population was assumed to be vaccinated against COVID-19. Hence, the sample size

becomes 384, and adding of a 10% non-response rate, the final sample size became 422. The study subjects were chosen using a consecutive sampling technique.

Study Variables
The outcome variable of the study was the acceptance of the COVID-19 vaccine (yes/no options). The dependent variables were respondents' sociodemographic data (sex, marital status, age, religion, self-rated health status, educational level, average monthly income, occupation, residence, presence of health insurance, and duration of chronic illness, know anyone infected with COVID-19), the socio-political variable of the respondents, knowledge, and attitude towards COVID-19 vaccine.

Operational Definitions
COVID-19 vaccine acceptance was measured using "Yes" and "No" questions, respondents were asked "Are you willing to be vaccinated against COVID-19?"; Seven items were used to assess respondents' knowledge about the COVID-19 vaccine. Those who correctly answered the question received one point, while incrrect resnse was given zero values. Respondents who scored 70% and above were taken as having good knowledge while those who scored less than 70% were considered as having poor knowledge towards the COVID-19 vaccine.[40]

Eight items were used to assess the respondents' attitude on the COVID-19 vaccine. Those who agreed received 3 points, neutral 2 points, and disagreed got 1 point for positive questions and vice versa for negative quoted attitude questions. The respondents' attitudes ranged from 1 to 24, with a cutoff of greater than or equal to 70% (17–24) were considered as a positive attitude while less than 70% (17) were taken as having a negative attitude towards the COVID-19 vaccine.[40]

Data Collection and Quality Assurance
The data was collected using a pre-tested structured questionnaire, which was adapted from published papers.[40–43] It consists of five sections including, socio-demographic characteristics of the participants and sources of information towards COVID-19 vaccine, knowledge about COVID-19 vaccine, attitude towards COVID-19 vaccine, socio-political factors, and acceptance of COVID-19 vaccine. The questionnaire was prepared in English language and translated to the local language (Amharic) and re-translated back to the English version to ensure consistency. The pre-test was conducted among 5% of the

sample size in Borumeda hospital to ensure the validation of the tool. Hence, amendment was done based on the feedback of the pre-test before the commencement of the final data collection. Training was given for the data collectors and supervisors on the aim of the study, clarity of the measuring tool, and ethical considerations. The data was collected from May 1 to 20, 2021 by three health officers and supervised by two master holders of Public Health experts. Before starting the analysis, 10% of the final sample size was used to check data entry errors.

Statistical Analysis

Data were entered into Epi-Data version 4.6 and exported to the Statistical Package for Social Science (SPSS) version 25.0 software for data cleaning and analysis. Frequency and percentage were used to describe the categorical variables whereas mean with standard deviation for continuous variables. Binary logistic regression analysis using bivariable analysis and multivariable analysis was used to determine the association between the dependent and the outcome variable of the study. In the bivariable analysis using crude odds ratio (COR) variables with p values of less than 0.25 were retained for multivariable analysis. Then in multivariable analysis, p values of less than 0.05 at 95% CI were taken as factors significantly associated with the acceptance of the COVID-19 vaccine. The multicollinearity among independent variables was checked using standard error at the cutoff value of -2 to $+2$ and none of the deendent variables . Furthermore, model fitness was checked using the Hosmer and Lemeshow test and we found a P value of 0.865, which was fit.

Ethical Consideration

The stud was conducted following Helsinki Declaration. Ethical clearance was obtained from the ethical review committee of the College of Medicine and Health Sciences, Wollo University. Permission to conduct the study was obtained from Dessie Comprehensive Specialized Hospital. Before starting the data collection, the aim of the study was explained to the respondents. Verbal informed consent was obtained from participants who could not read and write, and the verbally informed consent process was approved by the ethical review committee of Wollo University, while written informed consent was btained from participants who can read and write. The confidentiality of the study particiants were ensured by aviding an identifier like name. Partication in the stud was based on vlunteer decision. Privacy was kept by taking the data anonymously, and also the participants had the right to be excluded from the study if they did not want to participate. Particiants have also told as the have the right to withdraw from the study at any stage.The data collection was conducted by applying the WHO recommended COVID-19 prevention measures such as wearing face masks, keeping social distancing, and using alcohol-based hand sanitizer.

Results

Socio-Demographic Characteristics of Study Participants

A total of 416 respondents participated in the study with a response rate of 98.6%. About half 231 (50.4%) of the respondents were females. The majority of the respondents were Muslims, college and above educational level, and housewives with a value of 202 (48.6%), 123 (29.6%), and 115 (27.6%), respectively. Furthermore, half 215 (51.7%) of the study participants had received necessary vaccines in their life before the occurrence of COVID-19. More than one quarter 111 (26.7%) of the respondents were attending in the hospital due to respiratory diseases. Finally, less than ten percent 28 (6.7%) of the respondents were current smokers during the data collection (Table 1).

Sources of Information About COVID-19 Vaccine

The current finding revealed that the majority 358 (86.1%) of the participants used neighbors as sources of information towards the COVID-19 vaccine. One-third 141 (33.9%) of the participants used HCPs as sources of information about the COVID-19 vaccine. A lower number of respondents 84 (20.2%) used newspapers as sources of information towards the COVID-19 vaccine. Furthermore, less than half 189 (45.4%) of them used social media as sources of information towards the COVID-19 vaccine. Less than half 192 (46.2%) of the participants used radio and television as sources of information towards the COVID-19 vaccine (Table 2).

Knowledge About COVID-19 Vaccine

Less than two-thirds 261 (62.7%) of the respondents had good knowledge about the COVID-19 vaccine. More than three-quarters 336 (80.8%) of the respondents knew that COVID-19 is prevented through vaccine. About half 205 (49.5%) of the respondents correctly

Table 1 Socio-Demographic Characteristics of Patients with Chronic Disease Visiting in Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia May 1 to 20, 2021

Variable	Category	Frequency(n) (%)
Sex	Male	185 (49.6)
	Female	231 (50.4)
Age (years)	18–29	133 (32.0)
	30–39	97 (23.3)
	40–49	67 (16.1)
	50–59	43 (10.3)
	>60	76 (18.3)
Religion	Orthodox	174 (41.8)
	Muslim	202 (48.6)
	Protestant	40 (9.6)
Marital status	Single	90 (21.6)
	Married	312 (75.0)
	Widowed	14 (3.4)
Highest educational level	Unable to read and write	78 (18.7)
	Informal education	119 (28.6)
	Primary (grade1-8)	57 (13.7)
	Secondary (grade 9–12	39 (9.4)
	College and above	123 (29.6)
Residence	Urban	226 (54.3)
	Rural	190 (45.7)
Occupation	Housewife	115 (27.6)
	Private worker	59 (14.2)
	Farmer	81 (19.5)
	Government employer	81 (19.5)
	Unemployed	80 (19.2)
Smoking status	Never smoked	336 (80.8)
	Former smoker	52 (12.5)
	Current smoker	28 (6.7)
Presence of health insurance	Yes	212 (60.0)
	No	204 (40.0)
Presence of high-risk groups in househlds	Yes	213 (51.2)
	No	203 (48.8)

(*Continued*)

Table 1 (Continued).

Variable	Category	Frequency(n) (%)
History of vaccine	Yes	215 (51.7)
	No	201 (48.3)
Travel history	Yes	246 (59.1)
	No	170 (40.9)
Average monthly income ($)	≤ 37.5	102 (24.5)
	37.525–75	218 (52.4)
	≥75.025	96 (23.1)
Types of chronic illness	Hypertension	62 (14.9)
	Respiratory disease	111 (26.7)
	Diabetes mellitus	86 (20.7)
	HIV	89 (21.4)
	Heart disease	55 (13.2)
	Others*	13 (3.1)
Duration of attending follow up	Less than five years	76 (18.3)
	5–10 years	150 (36.0)
	>10 years	190 (45.7)
Do you know anyone diagnosed with COVID-19	Yes	199 (47.8)
	No	217 (52.2)

Note: *Cancer, renal, liver disease.

Table 2 Sources of Information Towards COVID-19 Vaccine Among Patients with Chronic Diseases Visiting in Dessie Comprehensive Specialized Hospital, Northeast Ethiopia May 1–20, 2021 (N=416)

Sources of Information on COVID-19 Vaccine	Frequency	Percentage
Health professionals	141	33.9
Friends	262	63.0
Nighbours	358	86.1
Famil members	330	79.3
Newsaers	84	20.2
Internet	115	27.6
Social media	189	45.4
Mass media (radio and television)	192	46.2

replied that AstraZeneca and Covishield vaccines are currently administered against COVID-19 in Ethiopia. Furthermore, less than three-quarters 310 (74.5%) of the respondents knew that the COVID-19 vaccine is given freely. More than three-quarters 325 (78.1%) of the respondents knew that HCPs, patients with chrnic

Table 3 Knowledge About COVID-19 Vaccine Among Patients with Chronic Disease Visiting in Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia, May 1–20, 2021

Items	Yes	No	I Do Not Know
	n (%)	n (%)	n (%)
COVID-19 can be prevented by the vaccine.	336 (80.8)	55 (13.2)	25 (6.0)
AstraZeneca and Covishield are the two vaccines used in Ethiopia.	205 (49.3)	78 (18.7)	133 (32.0)
The vaccine is given two times within 28 days apart	190 (45.7)	81 (19.5)	145 (34.8)
The vaccine is provided for free in Ethiopia	310 (74.5)	74 (1.8)	32 (7.7)
The provision of the vaccine is based on voluntary not obligatory.	343 (82.5)	53 (12.7)	20 (4.8)
Healthcare professionals, chronic patients, and elders are the prioritized groups for vaccination	325 (78.1)	49 (11.8)	42 (10.1)
The vaccine of COVID-19 vaccine has started	211 (50.7)	124 (29.8)	81 (19.5)

diseases, and elders are the prioritized groups to be vaccinated against COVID-19 in Ethiopia (Table 3).

Attitude of Chronic Patients Towards COVID-19 Vaccine

Less than two-thirds 298 (61.6%) of the respondents had a positive attitude towards the COVID-19 vaccine. Similarly, less than two-thirds 253 (60.8) of the respondents agreed that the COVID-19 vaccine is important for their life. lower number 170 (40.9%) of the respondents agreed that the COVID-19 vaccine should be given to all populations of Ethiopia within a short time. More than half of the respondents agreed that the COVID-19 vaccine is against our tradition and culture (Table 4).

Social and Political Factors of COVID-19 Vaccine Acceptance

About a quarter 97 (23.3%) of the respondents perceived that they were at high risk of contracting COVID-19 infection. Furthermore, over three-quarters, 345 (82.9%) of the respondents trust the governments of Ethiopia towards the

COVID-19 vaccine. On the other hand, lower number 275 (66.1%) of the respondents trust the public health authorities towards the COVID-19 vaccine (Table 5).

Factors Associated with Willingness to Accept COVID-19 Vaccine

The current finding revealed that less than two-thirds 247 (59.4%) of the respondents were willing to accept the COVID-19 vaccine while the remaining 169 (40.625%) refused to the vaccine. According to the binary logistic regression analysis, having health insurance, knowing anone diagnosed with COVID-19, knowledge, and attitude towards the COVID-19 vaccine were significantly associated with COVID-19 vaccine acceptance. Participants who had health insurance were 1.812 (95% CI; 1.703–3.059) times more likely to accept the COVID-19 vaccine than those without it. Furthermore, those who knew anone diagnosed with COVID-19 were 2.482 (95% CI; 1.427–4.317) times more likely to accept the COVID-19 vaccine than those who did not know. Respondents who had good knowledge about the COVID-19 vaccine were 6.890 (95%

Table 4 Attitude Towards the COVID-19 Vaccine Among Patients with Chronic Diseases visiting in Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia, May 1 to 20, 2021

Attitude Related Questions	Agree	Neutral	Disagree
	N (%)	N (%)	N (%)
Does the COVID-19 vaccine is essential for you?	253 (60.8)	65 (15.6)	98 (23.6)
Do you think COVID-19 can be prevented by the vaccine?	286 (68.8)	88 (21.2)	42 (10.0)
The vaccine of covid-19 should be given to all	170 (40.9)	153(36.8)	93 (22.3)
COVID-19 vaccine is against your culture.	219 (52.6)	126 (30.3)	71 (17.1)
COVID-19 vaccine will save our time	215 (51.7)	164 (39.4)	37 (8.9)
COVID-19 vaccine will save money	234 (56.3)	119 (28.6)	63 (15.1)
Do you think you are susceptible to the infection of COVID-19 disease?	211 (50.7)	138 (33.2)	67 (16.1)
It is not possible to reduce the incidence of COVID-19 without vaccination	253 (60.8)	119 (28.6)	44 (10.6)

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Table 5 Social and Political Factors Affecting COVID-19 Vaccine Acceptance Among Patients with Chronic Diseases Attending Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia, May 1 to 20, 2021

Variables	Category	Frequency	Percentage
Self-reported perception risk of COVId-19	Low risk High risk	319 97	76.7 23.3
Trust in the government	Yes No	345 71	82.9 17.1
Trust on public health authorities	Yes No	275 141	66.1 33.9
Trust on vaccine manufacturer	Yes No	265 151	63.7 36.3

CI; 3.900–120.17) times more likely to accept the COVID-19 vaccine than those with poor knowledge. Finally, Participants with a positive attitude toward the COVID-19 vaccine were 7.725 (95% CI: 4.024–14.830) times more likely to accept the COVID-19 vaccine than those with a negative attitude (Table 6).

Discussion

Institution-based cross-sectional study design was conducted among patients with chronic disease visiting Dessie Comprehensive Specialized Hospital from May 1–20, 2021. The objective of the study was to assess the acceptance of the COVID-19 vaccine and determinant factors. COVID-19 vaccines have been launched as the perfect solution for bringing the pandemic of COVID-19 to an end in the world. Several countries across the world have approved specific vaccines for use in Ethiopia vaccination programs against the disease of COVID-19.[23] For better implementation of the program, knowledge, and attitudes towards the COVID-19 vaccine is critical to understand the epidemiological dynamics of disease control, effectiveness, compliance, and success of the vaccination program. But vaccine hesitancy is one of the most significant barriers to the successful implementation of the programs.[44] Therefore, vaccine acceptance have a decisive role in successful control of the COVID-19 pandemic.[45]

Herd immunity is necessary to control the transmission of the pathogen which is dependent on the basic reproductive number for that infectious disease. The latest estimates on COVID-19 pointed out a range of 60–75% of the population should be vaccinated to halt the

transmission of the disease to develop herd immunity.[46] The finding of the present study revealed that less than two-thirds (59.4%) of the respondents were willing to be vaccinated against the COVID-19 vaccine which was lower than the vaccination level required for the development of herd immunity.[46] This finding was consistent with the finding in South Africa,[47] Ethiopia (62.6%),[13] in the Arab world (62.4%).[20] The finding of the study was higher than the findings in Pakistan (37.80%),[42] Ethiopia (46.1%),[48] Ethiopia (31.4%),[49] 16 countries across the continent (52.0%),[50] Nigeria (50.2%),[51] USA (36%),[52] Ethiopia (45.5%),[23] Turkey (29.2%).[53] On the contrary, it was lower than the finding in Canada (80.9%),[54] Mexico and India (80%),[50] China (91.3%),[36] Italy (67%),[55] low and middle-income countries (76.4%),[56] Colombia (77.0%),[57] India (78.6%),[28] India (79%),[44] Bangladesh (74.5%).[58] The low prevalence of vaccine acceptance may be due to the fact that the novelty COVID-19 disease. Hence, there may be mistrust and negative beliefs regarding the vaccine, lack of trust in the existing healthcare system, and information gaps mainly in LMIC countries. The acceptance of COVID-19 vaccine can be increased when a safe and effective vaccine is available freely or with a minimum cost. The low rate of vaccine acceptance in this high risk groups may have an adverse effects.[58] Hence, the provision of educational resources to equip Healthcare workers about the safety, importance of vaccination, and negative implication of refusing the vaccine should be implemented to improve the acceptance rate of the COVID-19 vaccine.[14]

Reluctance to receive these vaccines may be driven by doubts about immediate and long-term safety and efficacy, lack of trust in the development process of the vaccine, as well as background historical vaccine apathy in minority populations.[14] In the current finding, the presence of health insurance, knowing anyone who has been diagnosed with COVID-19, knowledge, and attitude towards COVID-19 vaccine were factors for the acceptance of the COVID-19 vaccine among the participants. Participants who knew anyone diagnosed with COVID-19 infection were one of the factors affecting COVID-19 vaccine acceptance which was consistent with the study finding in Libya,[40] Ethiopia[23,48] and China.[59] The finding of the study suggested that as there is a perception that the infection of COVID-19 is not in a real event in the world.

Furthermore, participants who had health insurance showed a significantly higher acceptance rate of COVID-19 vaccines which was in line with the findings in the

Table 6 Factors Associated with Willingness to Accept the COVID-19 Vaccine Among Patients with Chronic Diseases Visiting Dessie Comprehensive Specialized Hospital, Northeastern Ethiopia, May 1–20, 2021

Variable		Willingness		COR (95% CI)	AOR (95% CI)	P-value
		Yes	no			
Sex	Male	118	67	1.393 (0.937–2.071)	1.525 (0.889–2.587)	0.117
	Female	129	102	1	1	
Marital status	Single	64	26	1	1	
	Married	176	136	0.526 (0.265–2.256)	1.286 (0.296–5.586)	0.737
	Widowed	7	7	0.406 (0.130–1.273)	0.596 (0.126–2.818)	0.514
Religion	Orthodox	117	57	0.988 (0.475–2.058)	1.644 (0.625–4.326)	0.314
	Muslims	103	99	0.5.07 (0.4752.058)	1.644 (0.625–4.326)	<0.0001
	Protestant	27	13	1	1	
Health insurance	Yes	136	76	1.499 (1.012–2.222)	1.812 (1.703–3059)	0.026
	No	111	93	1	1	
Vaccination history	Yes	126	75	1.305 (0.881–1.933)	1.263 (0.750–2.126)	0.380
	No	121	94	1	1	
Know diagnosed with covid-19	Yes	129	70	1.546 (1.042–2.295)	2.482 (1.427–4.317)	0.001
	No	118	99	1	1	
Trust the gov't of Ethiopia	Yes	213	132	1.756 (1.051–2.935)	1.322 (0.653–2.675)	0.438
	No	34	37	1	1	
Risk on COVID-19	Low risk	184	136	1	1	
	High risk	64	33	1.441 (0.896–2.138)	1.355 (0.722–2.543)	0.344
Knowledge	Poor	40	115	1	1	
	Good	207	54	11.021 (6.901–17.600)	6.890 (3.900–12.170)	<0.0001
Attitude	Negative	24	94	1	1	
	Positive	223	75	11.646 (6.930–19.569)	7.725 (4.024–14.830)	<0.0001

USA[52] and China.[60] There was a wide range of acceptance rates among participants; those who live in High-Income countries had the highest acceptance rate (70.2%), whereas those who live in LMIC had the lowest acceptance rate (57.4%).[20] But, according to the report of the Ethiopian ministry of health, the COVID-19 vaccine is given for free for Ethiopians. Therefore, HCps should work in enhancing the awareness of the population mainly for high-risk groups such as patients with chronic disease and elderly groups as the vaccine of COVID-19 is given freely for all Ethiopians.

Furthermore, participants who had good knowledge towards COVID-19 vaccine were another factor of the acceptance of the COVID-19 vaccine which was consistent with the findings in Pakistan,[42] Ethiopia,[13] and the USA.[61] Therefore, from this study we can clearly understand we are still in the backward position towards COVID-19 vaccine awareness creation since less than

two-thirds of the participants had good knowledge of the vaccine. Lastly, respondents who had a positive attitude towards the COVID-19 vaccines had a significantly higher acceptance rate of the COVID-19 vaccine which was supported by the findings in South Africa,[47] Ethiopia,[48] and the USA.[60] The current finding clearly showed that continuous awareness promotion on the necessity of the COVID-19 vaccine should be undertaken utilizing various information dissemination methods.

Less than two-thirds (62.7%) of the respondents had a good knowledge towards the COVID-19 vaccination which was lower than the finding in Ethiopia (74%),[13] China (80.7%).[59] This low level of knowledge towards the vaccine may be attributed due to the change in the target population, age, educational status and background, commitment of the healthcare authorities towards the disease and its vaccines, opportunity to use different sources of information towards COVID-19 vaccines. Less than

three-quarters (71.6%) of the participants had a positive attitude towards the COVID-19 vaccine which was consistent with the finding in China (70.07%).[59] The finding of the present study was higher than with the finding in Ethiopia (44%)[13] but lower than the finding in Bangladesh (78%).[9] The possible reason for this variation may be due to the change in risk perception towards COVID-19 and vulnerability to different diseases due to their poor immunity status, target populations.

Furthermore, less than two-thirds of the study participants agreed that the COVID-19 vaccine is essential for controlling the transmission of the disease which was higher than the study finding in Ethiopia.[48] This variation may be explained due to the difference in the target population, health status, risk perception towards COVID-19, and immunity status of the participants. Besides, a similar number of respondents 60.8% agreed that the incidence of COVID-19 may not be reduced without improving the vaccination coverage. This finding was higher than the study in Ethiopia (17.1%).[49] The possible reason for this variation may be due to the change in study period, variation in the target population.

Limitation of the Study

The current study has certain limitations. The use of cross-sectional study design which is the snapshot that is based on the principles of single-time visit and response. Furthermore, the use non probability sampling technique may be taken as another limitation of the study; hence generalization is difficult. Finally, the use of self-reported responses may lead to the development of social desirability bias.

Conclusion

The rapid development of the COVID-19 vaccine might have a great contribution to the emergence of concerns particularly for high-risk groups such as individuals with chronic diseases. Generally, the acceptance of the COVID-19 vaccine among the participants was low. The use of health insurance, knowing anyone diagnosed with COVID-19 infection, knowledge, and attitude towards the COVID-19 vaccine were factors of the acceptance of the COVID-19 vaccine. Hence, promotion of COVID-19 Vaccine should be done preferably by a trusted, centralized source of information like religious and political leaders. Healthcare professionals should conduct continuous awareness creation campaigns especially targeting the populations at a higher risk of the disease about the importance of the COVID-19 vaccine, safety, and its efficacy. Further studies like longitudinal and qualitative studies should be conducted to

identify additional barriers to vaccine acceptance particularly in high-risk groups.

Abbreviations

AOR, adjusted odd ratio; COR, crude odd ratio; CI, confidence interval; COVID-19, Coronavirus disease 2019; LMIC, Low and Middle Income; SARS COV-2, Severe Acute Respiratory Syndrome COV 2; USA, United State of America; WHO, World Health Organization.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Disclosure

The authors declare that they have no conflicts of interest in this work.

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