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ORIGINAL RESEARCH

RETRACTED ARTICLE: Willingness to Accept COVID-19 Vaccine and Associated Factors Among Adult Household Members in Dire Dawa City Administration, East Ethiopia

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Background: COVID-19 vaccine is a vital strategy to prevent and control this pandemic. This will depend principally on people's acceptance of COVID-19 vaccine. We aimed to determine the willingness to accept COVID-19 vaccine among adult household members of Dire Dawa city administration.

Methods: A community-based cross-sectional study was conducted among randomly selected 634 adult household members in the Dire Dawa city administration during January 16–31/2022. Data were collected using face-to-face interview. Extent of willingness was estimated using participants' self-report. Bivariate and multivariate logistic regression models were fitted, and statistical significance was set at *p*-value <0.05.

Results: The estimated willingness to accept COVID-19 vaccine was 28.4% (95% CI 25.1, 31.5) in the study setting. The odds of willingness to accept COVID-19 vaccine was higher for household members living without at least one chronic disease (AOR 1.7, 95% CI 1.10, 2.70), who had good knowledge score (AOR 2.3, 95% CI 1.31, 2.18) and positive attitude score (AOR 5.5, 95% CI 2.1, 14.5) compared to their counterparts, respectively. The estimated willingness to accept COVID-19 vaccine among household members with good knowledge score was 47.4 (95% CI 42, 52.7) and 15.5 (95% CI 8.7, 22.2) among those with poor knowledge. Nearly, 90% of the study participants had limited knowledge about COVID 19 vaccine.

Conclusion: The estimated willingness to accept COVID-19 vaccine in the study setting is very low and far from the set target to be reached by the end of 2022. Being free from chronic disease, and having good knowledge and positive attitude about COVID-19 vaccine were the main drivers for willingness. Public awareness directed to increase knowledge about COVID-19 vaccine and attitude change strategies should be scaled up to increase the COVID-19 vaccine uptake. Moreover, those individuals with chronic diseases need special attention.

Keywords: willingness, COVID-19 vaccine, Dire Dawa city administration

Introduction

The coronavirus disease-2019 (COVID-19) pandemic, caused by the novel severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), continues to affect the global health system.[1] Over 620 million people have been infected with SARS-CoV-2, resulting in over six million deaths worldwide as of September 27, 2022.[2] The African continent has continuously recorded fewer cases of COVID-19, with about 11.6 million cases and 250,238 deaths.[2] Ethiopia reported 493,671 cases, with 7572 deaths as of October 6, 2022.[3] Various biologic and chemotherapeutic therapies, including remdesivir, hydroxychloroquine, convalescent plasma, and tocilizumab, have been tried to treat COVID-19 patients with no decisive specific curative results, but the approval of remdesivir (Veklury) for the treatment of patients hospitalized with COVID-19 met this legal and scientific standard.[4–6]

Various public health measures including hand washing, lockdowns, respiratory hygiene, and social distancing have been applied with little success.[7] Administration of an effective vaccine as a long-standing solution in such an emergency would be of no choice.[8,9] A number of vaccine categories have been developed so far, with some approved and others still under clinical trials. Outstandingly, the AstraZeneca/University of Oxford Vaccines, the New York-based PfizerBioNTech, and Moderna Inc. Company have been approved for emergency use and by this time rolled out in some countries including Ethiopia.[10] Even though great achievement has been made with vaccine development, doubt about the community acceptance of COVID-19 vaccination is quite an important obstacle.[9] The World Health Organization (WHO) stresses that vaccine hesitancy is one of the top ten threats to global health and this is worsened by the emerging conspiracy theories about vaccines.[11]

Vaccine hesitancy is the "delay in acceptance or refusal of vaccination despite vaccines and vaccination services are available".[12] Refusal to accept vaccines can lead to outbreaks of vaccine-preventable diseases, slow vaccination rates, and delay in the timely attainment and sustainability of herd immunity.

The drivers of vaccine hesitancy can be lack confidence in the safety and effectiveness of vaccines and trust in the healthcare system and decision makers, and complacency about the vaccine and suitability which encompasses availability, affordability, and accessibility.[12] Key barriers to COVID-19 vaccine uptake include low socioeconomic status, concerns about efficacy and safety, mistrust of the healthcare system, lack of knowledge of the vaccine and its effectiveness, religious beliefs, poor access to immunization services, and rural residence.[13–16]

Recent studies have identified that related factors of unwillingness to accept COVID-19 vaccine were concerns about a general lack of trust in governments and the pharmaceutical companies that developed vaccines, and vaccine safety and side effects following vaccine administration.[17–22] As a part of the "Strategy to Achieve Global COVID-19 Vaccination by mid-2022", with global targets of 70% coverage, only 12.7% of the eligible African population had been fully vaccinated as of March 02, 2022.[23] This figure is far from the set target of 70% to be attained within roughly three months. Socio-cultural and spiritual beliefs also play a major role in willingness to accept COVID-19 vaccine in Africa, as the majority of the population in Africa is religious.[24] A study conducted in five west African countries found that the majority of the participants believed that prayer was more effective than vaccine against COVID-19.[25] Vaccine hesitancy has also been aggravated by the spread of misinformation not only by unqualified individuals but by community leaders, and religious and political leaders.[26] According to different studies conducted in Ethiopia, the COVID-19 vaccine hesitancy level in the Ethiopian population ranged from 14.1% to 68.7%.[27,28] As of September 27, 2022, 12.71 billion, over 1.4 billion, and over million doses of COVID-19 vaccine (AstraZeneca, Sinopharm, Johnson and Johnson, or Pfizer) had been administered globally, in Africa, and in Ethiopia, respectively. From this figure nearly 44.5% have received at least one dose, and 30.5% had been fully vaccinated.[3] Thus, the COVID-19 vaccination coverage for Ethiopia in general and for Dire Dawa in particular is far from the set target planned to be reached by mid-2022. Moreover, there were documented studies with regard to COVID-19 vaccine hesitancy in settings like Dire Dawa, where there are high-risk social interactions and high population movements.

Assessing the willingness to accept COVID-19 vaccine and identifying hindering factors would be vital to assist decision makers with evidence based interventions programs aiming at promotion of COVID-19 vaccine uptakes. Thus, the aim of this study was to assess the willingness to accept COVID-19 vaccine and associated factors in Dire Dawa city administration, East Ethiopia.

Methods

Design, Setting, and Population

Community-based cross-sectional study was employed among 634 randomly selected adult household members residing in Dire Dawa city administration, during January 16–31/2022. Dire Dawa city administration is located 515 km to the east of the national capital, Addis Ababa. The estimated total population of Dire Dawa administration is 507,000 (323,000 for Dire Dawa city administration) according to the population projection by the Ethiopian Central Statistical Agency.[29] Dire Dawa city administration is divided into nine operational woredas (the lowest administrative geographical subdivision in this study setting), with an estimated total number of ~60,202 households.

One referral hospital, one primary hospital, and eight health centers had been currently providing the static and outreach COVID-19 vaccination services in the study setting. Approximately, 70,000 vaccine doses (AstraZeneca, Johnson and Johnson, Pfizer, or Sinopharm) had been administered in the study area as of September 30/2022. All adult household members whose age is greater than 18 years, who did not take any type and dose of COVID-19 vaccine, and had lived in the city for at least six months were included into the study. Adult household members who were critically sick and unable to respond and those with documented mental health problems were excluded from the study.

Sample Size and Sampling Technique

One population proportion formula was used to determine the sample size of 634 using 50% level of willingness to accept COVID-19 vaccine (due to absence of documented community level study in Ethiopia), margin of error 0.05 at 95% confidence interval, design effect of 1.5, and 10% non-response rate. We randomly selected three operational woredas from nine operational woredas using simple random sampling technique. In the three randomly selected operational woredas, there were a total of 12,680 households. The calculated sample size of 634 households was proportionally allocated among the three operational woredas. Accordingly, 314 households in Jegeharie, 162 for Sabian, and 156 for Gendakore operational woreda were proportionally allocated. Households were selected using systematic random sampling method, and, in the case of multiple adult members in the household, one adult household member was selected by using simple random sampling technique (Figure 1).

Study Variables

The outcome variable of interest was willingness to accept the COVID-19 vaccine. Participants were asked whether they were willing to accept to receive COVID-19 vaccines since the approved vaccines were available in Dire Dawa, with two response levels (willing, unwilling). History of vaccination other than the childhood routine vaccine, source of information for COVID-19 vaccine, history of chronic illnesses, history of COVID-19 infection, practice of COVID-19 prevention modalities, knowledge about COVID-19 vaccine, and attitude to COVID-19 vaccine were some of the explanatory variables recorded during the interview.

Measurements

Knowledge about COVID-19 vaccine was assessed using seven standard questions modified and used from other previous studies.[8,30–33] The responses consisted of (3 = yes, 2 = no, and 1 = not sure/neutral). The overall mean knowledge was computed, and those who responded ≥80% of the questions were recorded as having good knowledge and those who responded below 80% were categorized as having limited knowledge about COVID-19 vaccine. Items in this knowledge category had a Cronbach's alpha of 0.86, which indicates good reliability. Similarly, attitude towards COVID-19 vaccine were assessed using six standard questions modified and used from other previous studies.[8,30–33] The responses were measured on a 5 response based scale which runs from strongly agree (strongly agree = 5) to strongly disagree (strongly disagree = 1) (see Annex). The overall attitude mean score was computed, and those whose had a mean score attitude ≥80% were categorized as having positive attitude to COVID-19 vaccine, and those who responded below 80% were categorized as having negative attitude to COVID-19 vaccine. Items in this attitude category had a Cronbach's alpha of 0.77, which indicates good reliability. Participants' practices of COVID-19 prevention measures like wearing face masks and social distancing measures were recorded. In this study, appropriate hand washing practice was considered as: a person washes hands – the front, back, finger nails, rub thumb, and palms with adequate water and detergent at least for twenty to thirty seconds or uses hand rub/sanitizer to the level of compliance. Likewise, proper physical distance was defined as when a person maintains one meter distance away from another person at social gatherings, during shopping, discussing, or during praying. Similarly, mask wearing practice was defined as a person covers the nose and mouth with mask or handkerchief or any type of cloth. Data were collected by trained medical doctors and nurses using modified tools adopted from other previous studies.[8,31–33] Data collection tool was primarily developed in English language and later translated to the local language, Amharic, and then back to English to maintain its consistency.

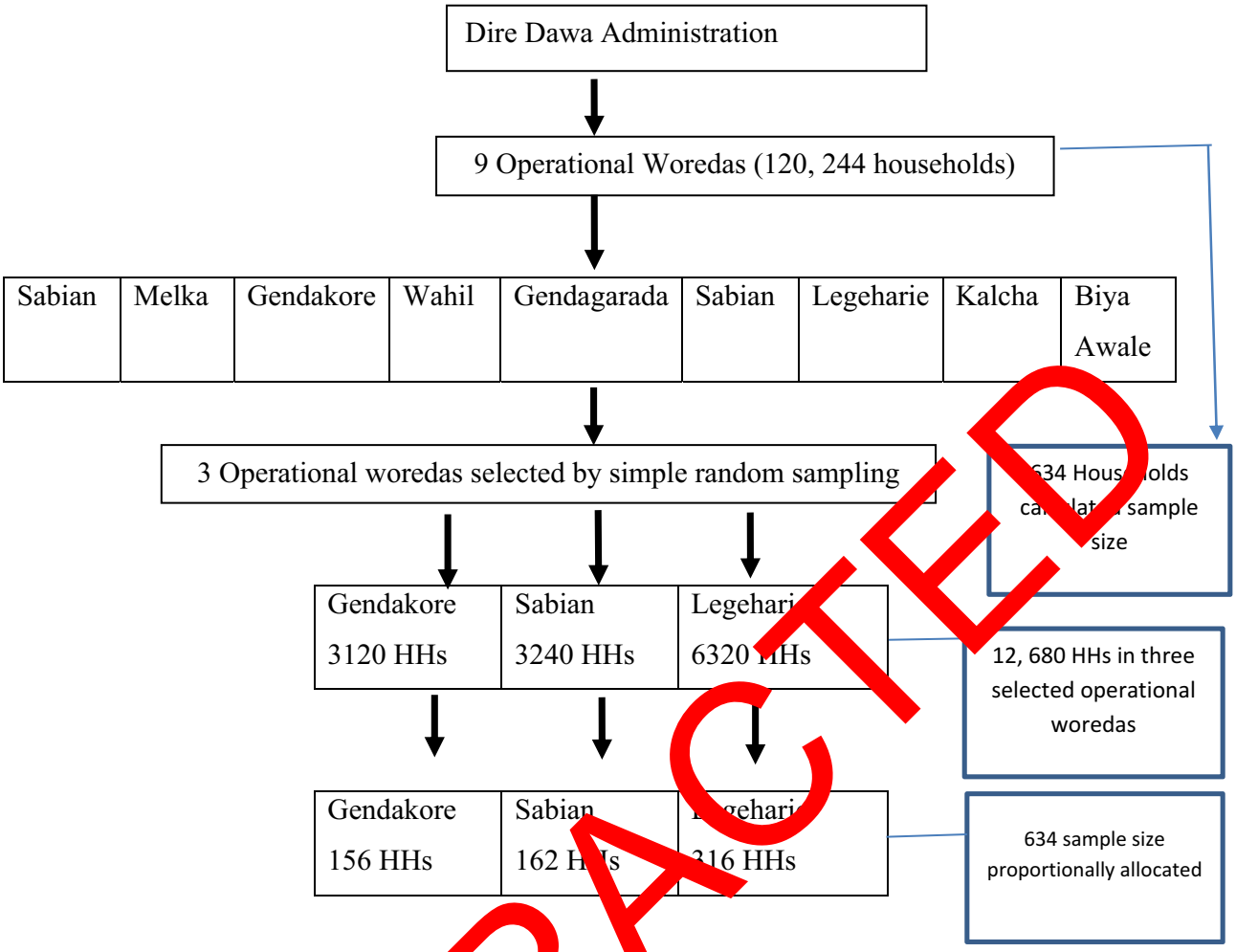

Figure 1 Schematic presentation of the sampling procedure.

Statistical Analysis

We entered data using EpiData version 3.1 and analyzed using Stata 14.[34] We estimated the prevalence of willingness to accept COVID-19 vaccine as the proportion of individuals who responded as willing to accept. The overall estimates of magnitude of willingness to accept COVID-19 vaccine and the corresponding 95% CI were generated using Stata. Statistical difference in willingness level between two groups was examined using two population proportion tests. Binary logistic regression model was fitted, and variables with p-value <0.2 were entered into the final model. Predictors of willingness to accept COVID-19 vaccine was determined using multivariate logistic regression model. Statistical significance was set at p-value <0.05.

Results

Socio-Demographic and Economic Characteristics of the Respondents

We analyzed data for 634 study participants. The mean (±SD) age of the study participants was 34.8 (SD ±12.6) years. Majority of the study participants were females (n=381, 60.1%) by sex, and 26–35 (n=226, 36%) age category. Nearly two-thirds (n=406, 64.1%) of the study participants have attended secondary and above education, and 373 (58.8%) of the study participants earn an annual household income of below 5000 ETB (Table 1).

Table 1 Selected Socio-Demographic Characteristics of the Participants for Unwillingness to Accept COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Variables	Category	*N* (%)
Age in years	≤25	160 (25.2)
	26–35	228 (36.0)
	36–45	132 (20.8)
	≥46	114 (18.0)
Sex	Male	253 (39.9)
	Female	381 (60.1)
Educational status (*N*=634)	No formal education	73 (11.5)
	Primary school (1–8)	15 (24.1)
	Secondary school (9–12)	188 (29
	Secondary or high	21 4.4)
	Other	2 (0.3)
Marital status (*N*=634)	Married	327 (51.6)
	Never married	256 (40.4)
	Divorced	20 (3.2)
	Widowed/separated	31 (4.9)
Annual household income in ETB	≤	373 (58.8)
	5001–13,000	221 (34.9)
	>13,000	40 (6.3)

Abbrev ion: Ethiopian Birr.

COVID-19 Rela ed Charac ristics of the Study Participants

From a total of 63 study p ticipants, 214 (33.8%) reported that they had COVID-19 related symptoms, 134 (21.1%) had been diagnosed osi e for COVID-19, and 130 (20.5%) were living with at least one chronic disease. From those living with t one hronic isease, exactly half of the study participants had diabetes mellitus (Table 2).

With egard t he prev s history of immunization except the routine childhood, the study participants self-reported that 36 7%) %), 256 (40.4%), and 8 (1.3%) had been vaccinated against hepatitis B, influenza, tetanus, and rabies, resp tively. Similarly, the respondents' self-report about the information source for COVID-19 vaccine indicated that 391 (61.7 183 (28.9%), 243 (38.3%), 591 (93.25%), and 72 (11.4%) got information from health professionals, neighbors, radio, television, and magazines or social media, respectively. In addition, the participants were asked about their preferred COVID-19 prevention modality. Accordingly, 614 (97%) suggested to wear masks, 589 (93%) preferred to adhere with hand washing, and 451 (71.2%) suggested to practice social distancing as a preferred prevention and control modality over getting vaccinated against COVID-19 vaccine.

Knowledge and Attitude-Related Characteristics of the Participants

With regard to the participants' knowledge of COVID-19 vaccine, exactly one-fifth, 127 (20%), had good knowledge about COVID-19 vaccine. From the total study participants, 521 (82.2%) were not sure that they had clear information

Table 2 Selected COVID-19 Related Characteristics of the Study Participants About Unwillingness to Accept COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Characteristics	Category	*N* (%)
COVID-19 related symptoms of the respondent	Yes	214 (33.8%)
	No	412 (65.0%)
	Not sure	8 (1.3%)
Previous history of COVID-19 test positive	Yes	134 (21.1%)
	No	500 (78.9%)
Friend, family member, or colleague diagnosed with COVID-19	Yes	142 (22.4%)
	No	492 (77.6%)
Friend, family member, or colleague died of COVID-19	Yes	69 (10.9%)
	No	565 (89.1%)
Presence of any chronic disease (633)	Yes	130 (20.5%)
	No	503 (79.5%)
Type of chronic disease (130)	DM	65 (50%)
	Hypertension	45 (34.6%)
	Other	20 (15.4%)

Abbreviations: DM, diabetes mellitus; COVID-19, corona virus disease.

about COVID-19 vaccine. Similarly, 242 (38.2%) of the study participants were not sure whether the COVID-19 vaccine contains dangerous ingredients or not (Table 3).

Attitude-Related Characteristics of the Study Participants

From the calculated overall mean attitude score we observed that the great majority of the study participants have negative attitude against COVID-19 vaccine acceptance. Accordingly, more than eighty percent of the study participants had not yet decided or strongly disagreed/disagreed that there is a right vaccine for COVID-19 (Table 4).

Willingness to Accept COVID-19 Vaccine

Few of the participants, 180 (28%), self-reported that they were willing to accept the COVID-19 vaccine during the interview period, and the vast majority were not willing to accept the COVID-19 vaccine. The study participants suggested different reasons for their unwillingness to accept COVID-19 vaccine. Accordingly, the reasons suggested by the participants were shortage of information for 82 (13.7%), due to lack of interest (since they perceive that COVID-19 is not serious disease) for 184 (40.6%), perception that COVID-19 vaccine is related to beast sign (666) for 75 (16.6%), perception that COVID-19 vaccine causes infertility for 86 (19%), and 68 (15%) perceive that COVID-19 vaccine has conspiracy of micro-chips (Table 5).

In addition to the above suggested reasons, fear of blood clotting, belief of the already developed immunity following prior infection, fear of injection site pain, and allergy were some of the other reasons suggested for unwillingness to accept COVID-19 vaccine.

Table 3 Knowledge-Related Factors of the Respondents About Unwillingness to Accept COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Knowledge-Related Factors	Yes *N* (%)	No *N* (%)	Not Sure *N* (%)
Have clear information about COVID-19 vaccine	40 (6.3%)	73 (11.5%)	521 (82.2%)
COVID-19 vaccine does not contain dangerous ingredients	140 (22.1%)	252 (39.7%)	242 (38.2%)
Is it possible to use booster dose COVID-19 vaccine	158 (24.9%)	140 (22.1%)	336 (53%)
COVID-19 vaccines reduce complications after contracting COVID-19	236 (37.2%)	253 (39.9%)	145 (22.9%)
COVID-19 vaccine has side effects	204 (32.2%)	210 (33.1%)	220 (34.7%)
COVID-19 vaccine increases allergic reactions	107 (16.9%)	111 (17.5%)	416 (65.6%)
COVID-19 vaccine increases autoimmune diseases	190 (30%)	174 (27.4%)	270 (42.6%)

Table 4 Attitude-Related Characteristics for Unwillingness to Accept COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Attitude-Related Factors	Strongly Agree *N* (%)	Agree *N* (%)	Undecided *N* (%)	Disagree *N* (%)	Strongly Disagree *N* (%)
There is a right vaccine for COVID-19	14 (2.2)	94 (14.8)	177 (27.9)	296 (46.7)	53 (8.4)
COVID-19 vaccine is safe	32 (5)	110 (17.4)	222 (35)	224 (35.3)	46 (7.3)
COVID-19 vaccine is effective	40 (6.3)	200 (31.5)	216 (34.1)	144 (22.7)	34 (5.4)
A person vaccinated against COVID-19 will no more transmit COVID-19	33 (5.2)	198 (31.2)	213 (33.6)	154 (24.3)	36 (5.7)
Law enforcement could increase the uptake of COVID-19 vaccine	53 (8.4)	131 (20.7)	214 (33.8)	191 (30.1)	45 (7.1)
COVID-19 vaccine is trustful	26 (4.1)	71 (11.2)	209 (33.0)	222 (36.1)	99 (15.6)

Abbreviation: COVID-19, corona virus disease.

Table 5 Reasons Suggested for the Unwillingness to Accept the COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Reasons Suggest Not to Accept COVID-19 Vaccine	Catego	*N* (%)
Shortage of adequate information with regard to COVID-19 vaccine (454)	Yes	62 (13.7)
	No	391 (86.3)
Lack of interest (not serious disease) (454)	Yes	184 (40.6)
	No	269 (59.4)
COVID-19 vaccine is related to beast sign (666) (454)	Yes	75 (16.6)
	No	378 (83.4)
COVID-19 vaccine causes infertility (454)	Yes	86 (19.0)
	No	367 (81.0)
COVID-19 vaccine itself is microchip (454)	Yes	68 (15.0)
	No	385 (85.0)
Willing to take COVID-19 vaccine	Yes	180 (28.4)
	No	454 (71.6)

Abbreviation: COVID-19, corona virus disease.

Factors Associated with Willingness to Accept COVID-19 Vaccine

A total of 12 variables were selected as potential candidate variables during binary logistic regression analysis. These included: sex of the study participant, death history of the study participants' relatives, testing and being positive for COVID-19, living with at least one chronic disease, history of vaccination other than the childhood vaccinations, heard COVID-19 vaccine information from health professionals, heard COVID-19 vaccine information from neighbors, heard COVID-19 vaccine information from radio, heard COVID-19 vaccine information from social media/magazines, prefer hand washing rather than getting vaccinated for COVID-19, knowledge of COVID-19 vaccine, and attitude to COVID-19 vaccine. These were the variables selected as candidates and entered into the final model (Table 6).

During the multivariable logistic analysis, three variables showed statistically significant association with willingness to accept COVID-19 vaccine. These included: participants living with at least one chronic disease, participants' knowledge of COVID-19 vaccine, and participants' attitude to accept COVID-19 vaccine. Accordingly, the odds of willingness to accept COVID-19 vaccine was higher for household members living without at least one chronic disease (AOR 1.7, 95% CI 1.10, 2.70) compared to those without chronic diseases. The observed difference between the two categories of having at least one chronic disease status was statistically significant ($p = 0.001$). Similarly, the study participants categorized as having good knowledge were more than two times as willing to accept COVID-19 vaccine when compared to their counterparts (AOR 2.3 95% CI 1.31, 2.18). The estimated willingness to accept COVID-19 vaccine among household members with good knowledge score was 47.4 (95% CI 42.1, 52.7), and 15.5 (95% CI 8.7, 22.2) among those with poor knowledge. Nearly 90% of the study participants had limited knowledge about COVID-19 vaccine. The observed difference between the two

Table 6 Multivariable Logistic Regression Model for the Predictors of Unwillingness to Accept COVID-19 Vaccine, Dire Dawa, Ethiopia, 2022

Characteristics	Category	Willingness to Accept COVID-19 Vaccine			
		COR (95% CI)	*p*-value	AOR (95% CI)	*p*-value
Sex	Male	1.3 (0.92–1.84)	0.14	1.3 (0.85–1.85)	0.26
	Female	Ref		Ref	
Friend, family member, or colleague died due to COVID-19	Yes	1.9 (1.11–3.12)	0.02	1.7 (0.93–3.01)	0.09
	No	Ref		Ref	
Ever tested and positive for COVID-19	Yes	1.5 (1.0–2.24)	0.05	1.3 (0.82–2.09)	0.27
	No	Ref		Ref	
Living with chronic disease	Yes*	1.6 (1.06–2.40)	0.03	1.7 (1.10–2.70)	0.02
	No	Ref		Ref	
Received any vaccine rather than childhood vaccines	Yes	1.4 (0.98–1.96)	<0.001	(0.94–2.08)	0.10
	No	Ref		Ref	
Heard COVID-19 vaccine information from health professionals	Yes	1.5 (1.04–2.16)	0.03	1.3 (0. –1.93)	0.25
	No	Ref		Ref	
Heard COVID-19 vaccine information from neighbors	Yes	1.6 (1.11–2.33)	012	1.3 (0.84–2.12)	0.22
	No	Ref		Ref	
Heard COVID-19 vaccine information from radio	Yes	1.4 (1.00–2.	<0.001	1.3 .86–2.0)	0.21
	No	Ref		ef	
Heard COVID-19 vaccine information from social media/ magazines	Yes	2.0 (1.19–3.25)	0.16	1.6 (0.90–3.0)	1.0
	No	R		Ref	
Prefer hand washing rather than getting vaccinated for COVID-19	Yes	2.6 (1.10–6.40)	0.03	2.1 (0.82–5.22)	0.12
	No	Ref		Ref	
Knowledge of COVID-19 vaccine	Poor knowledge	ef		Ref	
	Good k ledge*	3. .8–5.	<0.001	2.3 (1.31–2.18)	0.004
Attitude to COVID-19 vaccine	Negative titu	Ref		Ref	
	Positive at ude*	5. .1–13.5)	<0.001	5.5 (2.1–14.5)	0.001

Note: Ref, reference category, *$P < 0.05$.
Abbreviations: COR, crude odds ratio; AOR, adjusted odds io; CI, c idence in val.

categories of knowledge status w tistically si ificant ($p = 0.001$). In addition, the study participants categorized as having positive attitude to COVID-19 v cine were more than five times as willing to accept COVID-19 vaccine when compared to the study par pants with neg ve attitude (AOR 5.5, 95% CI 2.1, 14.5) (Table 6). The observed difference between the two categ es of att ude status was statistically significant ($p = 0.001$).

Discussio

Recently, v cinatin more than 70% of the global population by COVID-19 vaccine by the middle of 2022 has been highly empha to stop the COVID-19 pandemic.[35] This study was conducted to assist the decision makers in a poor economic setting reach the aforementioned figure by finding out the main bottlenecks hindering the general population from getting the CO ID-19 vaccine in Ethiopia. Thus, this study focused on determining the willingness level of the population to accept COVID-19 vaccine and the hindering factors in Dire Dawa city administration, Ethiopia.

In this study, few of the study participants, 180 (28%), were willing to accept COVID-19 vaccine at the time of interview. This finding is higher when compared to a study finding in Congo[35] and lower compared to studies conducted at different settings, 54.1% in Amhara,[32] 79.5% in New Delhi,[33] 48.9% in Africa.[39] The difference in willingness to accept COVID-19 vaccine in in this study might be due to the difference in study setting, difference in timing of the data collection, sample size, and definition of COVID-19 vaccine acceptance in different settings.

With regard to factors associated with willingness to accept COVID-19 vaccine, three factors were identified as significant driving forces for being willing to accept COVID-19 vaccine. These included: being a chronic patient, having

good knowledge about COVID-19 vaccine, and the positive attitude of the study participants to take COVID-19 vaccine. Accordingly, study participants living without at least one chronic disease including diabetes mellitus, hypertension, heart disease and others were significantly willing to accept COVID-19 vaccine. This finding is consistent with other studies conducted at different settings,[36–38,40–43] in which being a chronic patient has impacted COVID-19 vaccine uptake. It can also be explained that patients with chronic diseases are most likely concerned with probable side effects including blood clotting, and autoimmune diseases. This finding is also supported by finding from Ireland[39] and the UK.[44]

In this study, study participants with good knowledge were significantly more willing to accept the COVID-19 vaccine compared to those with limited knowledge status. This finding is in line with different other studies. In Bangladesh, limited knowledge of COVID-19 vaccine and fear of side effects were considered for COVID-19 vaccine hesitancy.[45] In addition, recent studies on COVID-19 vaccine acceptability found higher exposure to knowledge which might be the triggering point for vaccine uptake.[8,30,36] Additionally, studies have shown that knowledge and perceptions regarding COVID-19 vaccines are variable.[46]

In this study, study participants with positive attitudes were willing to accept COVID-19 vaccine. This finding is in line with other studies in which negative attitude has affected the uptake of COVID-19 vaccine.[46–48] In the Africa CDC survey, those with more trust and positive attitudes towards healthcare bodies and other authorities reported higher acceptance towards vaccinations in general and a COVID-19 vaccine.[47] Attitudes towards vaccination were affected by popular understandings of the virus: its origins, perceived risk profile such as mortality and severe illness rates, ideas of natural immunity, and the impact of variants on vaccine effectiveness.[47] Negative attitudes towards vaccine and conspiracy beliefs towards the COVID-19 vaccine related to the perceived severity of COVID-19 and perceived benefits of COVID-19 vaccination increased hesitancy.[48] Increased knowledge and awareness about the vaccine and the vaccination process was found to decrease vaccine hesitancy.[48] Unlike other studies done so far, recognized education, ethnicity, and age as the most important predictors,[36,49] did not show significant association with COVID-19 vaccine acceptance in this study. The explanation can be from differences in study setting, sample size, designs, and definitions.

Our study is not without limitations. Bias might have been introduced into our study from different angles. Social desirability bias in which study participants responded to questions in a manner that would be viewed favorably by others may have resulted in over-reporting of good attitudes and knowledges as well as intended uptake of vaccines. In addition, causal inferences cannot be drawn from this study due to the cross-sectional nature of the study. Moreover, it is essential to note that these findings are true for high density regions like Dire Dawa with high population movement and high inter-population interactions. This means that this study should not be generalized to other similar city administrations and other settings in east Africa.

Conclusion

The overall willingness to accept COVID-19 vaccine at the study setting is very far from the set target. Living without chronic diseases, having good knowledge, and positive attitude about COVID-19 vaccine were the main drivers. Public awareness targeted to increase knowledge about COVID-19 vaccine and attitude change interventions should be scaled up to increase the uptake. Moreover, those individuals with chronic diseases need special attention.

Abbreviations

IRB, institutional review board; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2; Africa CDC, Africa Centers for Disease Control and Prevention.

Data Sharing Statement

All data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate

Ethical clearance was obtained from institutional review committee of Dire Dawa administration regional health bureau. Data were collected after written informed consent was obtained from study participants. Permission to publish this study

was obtained from Dire Dawa regional health bureau. Moreover, we confirm that this study was conducted in accordance with Helsinki Declaration protocol.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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