

Original Research Article

Coronavirus disease 2019 vaccine acceptance, associated factors and perceived barriers among Dire Dawa university students, Ethiopia

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ABSTRACT

Background: Corona virus disease-2019 (COVID-19) is a family of severe acute respiratory infection first detected in 2019 in China. It has made high morbidity and mortality across the world. Currently, most countries including Ethiopia have taken preventive measures including vaccine. However, there is still limited evidence in COVID-19 vaccine acceptability and perceived barriers among some subgroups like university students. Therefore, this study was aimed to assess it and fill the information gap to enable intervention.

Methods: A cross-sectional study was conducted from April 01 to 30 2022 at Dire Dawa university and 337 students were selected using simple random sampling technique. Data was collected using structured, self-administered questionnaire, entered and cleaned by Epi DATA (Version 3.1) and analyzed using SPSS (Version 22). A $p < 0.2$ at Bivariate to select variables for multivariable and < 0.05 at multivariable with 95% CI was considered as statistical significance.

Results: COVID-19 vaccine acceptance was 26.7% (95% CI: 22-31.5%). Urban resident (AOR: 3.13, CI: 1.61-6.10), mothers' education (AOR: 3.48, CI: 1.44-8.43), knowledge (AOR: 2.23, CI: 1.21-4.11) and favorable intention towards COVID-19 prevention (AOR: 2.21, CI: 1.11-4.38) were independent factors associated with COVID-19 vaccine acceptance.

Conclusions: COVID-19 vaccine acceptance was lower than national average in Ethiopia. The predictors were residence, mothers' education, knowledge and intention towards COVID-19 prevention. Major barriers were misconceptions, uncertainty on effectiveness, concern on side effects and a need to know more about the vaccine. Integrated health education campaign on vaccine's misconception was recommended.

Keywords: COVID-19 vaccine, Acceptance, Associated factors, Barriers, Students

INTRODUCTION

Severe acute respiratory infection (SARS) is a group of respiratory tract infections caused by a beta coronavirus (SARS-COV2).^{1,2} Corona virus disease-2019 ("COVID-19") is a family of SARS caused by Novel Coronavirus and was first detected in December 2019 in Wuhan, China. Since it has been declared a global pandemic by world health organization (WHO), it has made the rapid spread across the world and causes high morbidity and mortality.¹⁻³

While evidence for airborne transmission of COVID-19 is currently incomplete, several hospital-based studies have performed air-sampling for SARS-COV-2, including one published paper.⁴

Droplets, aerosol, and close contact are the significant factors to transfer the infection (COVID-19 pandemic) to the suspect.^{5,6}

Based on currently available data, neither absence nor presences of signs or symptoms are accurate enough to

rule in or rule out COVID-19 disease.⁷ Worldwide, there is an estimated number of 5.8 million cases and nearly half a million deaths is occurred at the end of 2020 by COVID-19.⁸ COVID-19 disease is not limited to the respiratory system and it affects other organs too like renal dysfunction, gastrointestinal complications, liver dysfunction, cardiac manifestations, neurological abnormalities, and hematological manifestations are among the reported extra pulmonary complications.⁹ Moreover, according to studies in China and United States, on effects of the COVID-19 on college students' mental health show increased stress and anxiety due to the COVID-19 outbreak.¹⁰ Increases in negative affect and symptoms of anxiety and depression are observed after two weeks of confinement in China.¹⁰ And of the one hundred and ninety-five students, 71% indicate increased stress and anxiety due to the COVID-19 outbreak in the United States.¹¹

Due to the long-lasting pandemic situation and onerous measures such as lockdown and stay-at-home orders, the COVID-19 pandemic brings negative impacts on higher education.¹¹ Some of these negative impacts are psychological impacts, vulnerability to other diseases, burden of health care centers and workers, politics and social interaction, leadership disturbance.¹²⁻²¹ Moreover, education process disturbances, economic, social and political issues, the risks of sudden loss of income or access to social support have consequences that are difficult to estimate and constitute a challenge.²¹⁻²³ Another concern in African countries is that the response to COVID-19 will come at the expense of treating other diseases.¹⁵ So far, no definitive treatment for COVID-19 has been invented, and the disease has become a pandemic. Therefore, observation of hand hygiene, disinfection of high-touch surfaces, observation of social distance, and lack of presence in public places and wearing masks are recommended as preventive measures.²⁴ Currently, the principle fighting tool being promoted by the world health organization (WHO) is the prevention of acquiring severe acute respiratory infection by beta coronavirus SARS-COV-2 infection by following basic health hygiene rules and social distancing along with taking available COVID-19 vaccine.²⁵ Studies conducted across the globe, Africa including Ethiopia have been investigated the knowledge, attitude and practices toward the preventive measures of COVID-19 pandemic predominantly focused on health care workers and patients.^{17,18,26} Currently most countries including Ethiopia have taken incredible preventive measures including vaccine. The severity of the COVID-19 pandemic has demanded the emergency use of COVID-19 vaccines. However, there is still limited evidence in COVID-19 vaccine acceptability and perceived barriers among some subgroups like university students. Therefore, this study aimed to assess COVID-19 vaccine acceptance, associated factors, and perceived barriers among Dire Dawa university graduating class students, Ethiopia.

METHODS

Study design, period and setting

An institution -based cross-sectional study was conducted from April 01 to 30 2022 at Dire Dawa university, eastern Ethiopia. Dire Dawa University is located in Dire Dawa administration which is located to the eastern part about 515 kilometers away from Addis Ababa, the capital city of Ethiopia. It opened for the 2006-07 academic year with 754 students, as one of the 13 new universities started by the ministry of higher education, federal democratic republic of Ethiopia. Currently, the university has five colleges (Law, medicine and health sciences, business and economics, social sciences and humanities, natural and computational sciences), one institute of technology and school of graduate studies. It has 48 under-graduate programs and 46 post-graduate programs.

Source and study population

All Dire Dawa university students were the source population and graduating class students during the data collection period were the study population.

Inclusion and exclusion criteria

All graduating class students of Dire Dawa University during the data collection period were included because they were the first candidates during school reopening after COVID-19 "lockdown" as our focus during the proposal of this study. However, three students with active severe malaria were excluded because of unable to give full responses intended to this study.

Sample size determination

The sample size was determined by using a single proportion formula by considering the following assumptions: 69.3% proportion from a study, $Z_{\alpha/2}$ =value of standard normal distribution in 1.96 level of significance with a 95% confidence level and 5% margin of error.

$$n = \frac{(Z_{\alpha/2})^2 \times p(1-p)}{d^2} = \frac{(1.96)^2 \times 69.3\%(1-69.3\%)}{(0.05)^2} = 327 \text{ considering } 5\% \text{ non-response rate} = 343$$

Sampling technique and procedure

Study participants were recruited from all regular graduating class students using a simple random sampling technique (SRS). Twelve representative departments were selected from all five colleges and one institute of technology. In each of the selected departments was selected using lottery method. A sampling frame was prepared by obtaining the list of students from the registrar office. Then, in the selected departments, the required sample size was proportionally allocated based on the total number of students. Lastly,

from all students of the selected departments, SRS was done to pick the required sample size using a pre-determined sampling frame of all departments.

Measurements and operational definitions

Vaccine: a substance used to stimulate the production of antibodies and provide immunity against a disease.^{27,29}

Vaccine acceptance: is defined as the willingness to take the COVID-19 vaccine.²⁹⁻³¹

Accordingly, the participants were asked their willingness to accept the COVID-19 vaccine; the possible answers were 'Yes' or 'No'. A score of "1" was given for Yes and a score of "0" was given for No.

Knowledgeable to COVID-19: Participants who scored above mean on 11 knowledge assessment questions.^{27,32}

Favorable intention to practice COVID-19 prevention measures: Based on the summative scores designed to assess intention of COVID-19 prevention practice, a score above mean considered as favorable intention.^{27,32}

Good COVID-19 prevention practice: A total of 13 items were prepared to assess COVID-19 preventive practice. Based on summative score above the mean considered as good preventive practice.^{27,33-35}

Data collection tools and procedures: A structured, pretested, and self-administered questionnaire was used to collect the data. Socio-demographic characteristics, knowledge and COVID-19 prevention practice-related characteristics were included in the study tool. Four Bachelor of Science and two Master of Science in midwifery holders were recruited for data collection and supervision respectively. To minimize further risks of COVID-19 transmission, data collectors and participants were following the precautionary measures as per the guidelines for the prevention of COVID-19.

Data quality control

The questions prepared in English were initially translated into local languages (Afan Oromo and Amharic) and then again into English to ensure consistency. It was pre-validated by three independent reviewers, and a pre-test study was conducted with 5% of the sample size outside the study area. The data collectors and supervisors received a one-day training regarding the objective of the study, the procedures, and the necessary precautions, the means to collect, and keep confidential the information obtained from the respondents before the actual data collection.

Data processing and analysis

The data was verified, coded, and captured in Epi Data (Version 4.6) and exported to SPSS (Version 25 for

analysis. Descriptive statistics were used to describe participants' characteristics. Candidate variables were identified by cross-tabulation and progressed to bivariable logistic regression analysis. Thereafter, all explanatory variables included in multivariable logistic regression analysis model to handle effect of possible confounders and to identify independent factors affecting vaccine acceptance against COVID-19. Adjusted odds ratio with its 95% confidence interval (CI) and $p \leq 0.05$ used to declare significant statistical analysis.

Ethical considerations

Ethical approval was obtained from the institutional ethical review board (IRB) of Dire Dawa University. Anonymous informed voluntary consent was taken from each participant after a clear description of the aim and rights of the study participants.

RESULTS

Socio-demographic characteristics

a total of 337 study participants were included, yielding a response rate of 98.2%. The age of respondents was ranged from 18 to 36 (mean =24.7 years, $SD \pm 4$ years). More than half (65% and 62.9%) of the respondents were below the age of 25 years and rural resident respectively (Table 1). Most of the respondents (85.2%) were male and their families were not infected with COVID-19 pandemic (83.1%) (Table 1).

Participant's knowledge about COVID-19, intention and practice towards its prevention

Regarding COVID-19, 191(56.7%) and 123(36.5%) study participants had good knowledge about COVID-19 and favorable intention to COVID-19 prevention. But most study participants (85.5%) had no practice on COVID-19 prevention.

Acceptance of COVID-19 vaccine and perceived barriers

Out of 337 study participants, 26.7% (95% CI: 22-31.5%) had COVID-19 vaccine acceptance.

The main reasons for non-acceptance (perceived barriers) (n=247) were perceived to control birth/population growth (27.1%) and a need to know more about the vaccine (24.3%) (Figure 1).

Factors associated with COVID-19 vaccine acceptance

Residence, marital status, mothers' education level, family members ever infect with COVID-19, field of study, having a smartphone, knowledge about COVID-19, practice on COVID-19 prevention and intention towards COVID-19 prevention were candidate variables in the bivariate model at p value less than 0.20 (Table 2).

In the multivariable logistic regression analysis urban residence (AOR=3.13, 95% CI: 1.61-6.10), mothers' education level (AOR=3.48, 95% CI: 1.44-8.43), knowledge about COVID-19 (AOR=2.23, 95%

CI: 1.21-4.11) and intention towards COVID-19 prevention (AOR=2.21, 95% CI: 1.11-4.38) were found to have a significant association with COVID-19 vaccine acceptance (Table 2).

Table 1: Socio-demographics of study participants, Dire Dawa University, Dire Dawa, eastern Ethiopia, 2022 (n=337).

Variables	Category	Frequency	Percentage (%)
Age (Years)	<25	219	65.0
	≥25	118	35.0
Residence, (n=337)	Urban	125	37.1
	Rural	212	62.9
Sex	Female	50	14.8
	Male	287	85.2
Marital status	In relationship	82	24.3
	Married	35	10.4
	Single	220	65.3
Mothers' education level	Post-secondary	192	57.0
	Secondary	37	11.0
	primary	69	20.5
	No formal education	39	11.6
Fathers' education level, (n=330)	Degree and above	59	17.9
	Diploma	63	19.1
	Secondary	40	12.1
	Primary	124	37.6
	No formal education	44	13.3
Average monthly income gained in Ethiopian birr	<1000	202	59.9
	≥1000	135	40.1
Field of study	Health	108	32.0
	Non health	229	68.0
Do you have a smartphone?	Yes	209	62.0
	No	128	38.0
Do your family members use COVID-19 prevention methods?	Yes	176	52.2
	No	161	47.8
Do your family members ever infect with COVID-19?	Yes	57	16.9
	No	280	83.1

Table 2: Bivariate and multivariable logistic regression analysis of variables on COVID-19 vaccine acceptance among Dire Dawa university students, Dire Dawa, eastern Ethiopia, 2022, (n=337).

Variables	Category	COVID-19 vaccine acceptance, n (%)		COR (95% CI)	AOR (95% CI)	P value
		Yes	No			
Residence, (n=337)	Rural	65 (30.7)	147 (69.3)	1	1	
	Urban	25 (20.0)	100 (80.0)	1.80 (1.04-3.00)	3.13 (1.61-6.10)	0.001
Gender	Male	83 (28.9)	204 (71.1)	1	1	
	Female	7 (14.0)	43 (86.0)	2.50 (1.08-5.78)	2.10 (0.43-10.25)	0.359
Marital status	In relationship	14 (17.1)	68 (82.9)	2.13 (1.12-4.05)	2.01 (0.96-4.19)	0.062
	Married	9 (25.7)	26 (74.3)	1.26 (0.56-2.84)	0.76 (0.29-1.99)	0.578
	Single	67 (30.5)	153 (69.5)	1	1	
Mothers' education level	Post-secondary	28 (14.6)	164 (85.4)	3.28 (1.52-7.06)	3.48 (1.44-8.43)	0.006
	Secondary	19 (51.4)	18 (48.6)	0.53 (0.21-1.33)	0.47(0.16-1.37)	0.166
	Primary	29 (42.0)	40 (58.0)	0.77 (0.34-1.74)	0.63 (0.26-1.56)	0.322
	No formal education	14 (35.9)	25 (64.1)	1	1	

Continued.

Variables	Category	COVID-19 vaccine acceptance, n (%)		COR (95% CI)	AOR (95% CI)	P value
		Yes	No			
Family members ever infected with COVID-19	No	83 (29.6)	197 (70.4)	1	1	
	Yes	7 (12.3)	50 (87.7)	3.00 (1.31-6.91)	2.28 (0.86-6.04)	0.097
Knowledge	Poor	49 (33.6)	97 (66.4)	1	1	
	Good	41 (21.5)	150 (78.5)	1.85 (1.13-3.01)	2.23 (1.21-4.11)	.010
Practice on COVID-19 prevention	Yes	83 (28.8)	205 (71.2)	2.43 (1.05-5.63)	1.65 (0.33-8.11)	.539
	No	7 (14.3%)	42 (85.7)	1	1	
Intention towards COVID-19 prevention	Unfavorable	71 (33.2)	143 (66.8)	1	1	
	Favorable	19 (15.4)	104 (84.6)	2.72 (1.54-4.78)	2.21 (1.11-4.38)	0.024
Field of study	Non health	70 (30.6)	159 (69.4)	1	1	
	Health	20 (18.5)	88 (81.5)	1.94 (1.10-3.40)	1.40 (0.71-2.76)	0.335
Do you have a smartphone?	No	26 (20.3)	102 (79.7)	1	1	
	Yes	64 (30.6)	145 (69.4)	0.60 (0.34-0.97)	0.74 (0.40-1.35)	0.324

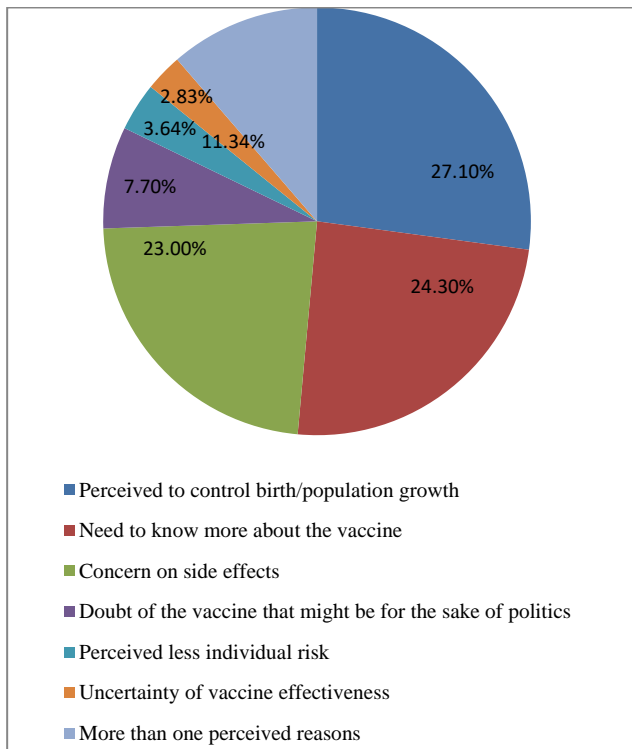


Figure 1: Main reasons/barriers for not willing for COVID-19 vaccine acceptance among Dire Dawa university students, Dire Dawa, eastern Ethiopia, 2022 (n=247).

DISCUSSION

This study identified the proportion of COVID-19 vaccine acceptance, associated factors and perceived barriers for non-acceptance among Dire Dawa University

first degree regular graduating class students. The findings showed out of three hundred thirty-seven study participants, 26.7% (95% CI: 22-31.5%) had COVID-19 vaccine acceptance. This finding was lower than studies conducted in China=36.4%, Canada, by University of British Columbia (91.99%, by medical students and 59.42%, by non-medical students), Italy (Naples) (85.7%), France (58.0%) and Japan, by Dokkyo Medical University (90.7%).³⁶⁻³⁹

This finding was also lower than a study in Palestinian (46%) and some studies in Africa, Sudan (55.8%), Nigeria (40%), Prague, Czech university (73.3%) and southern Ethiopia, Wolkite University (58.8%).^{29,31,40-42}

The possible explanations for such discrepancy might be variations in some socio-demographic characteristics of study participants like age and education level, geographical area, sample size and study period differences. In this study first degree graduating class University students were the study population and in the other studies all education level was involved. Besides, the type of fields might make discrepancy, in this study all types, medical and non-medical university students were involved while some of the other studies involved only medical students.

According to this study the odds of COVID-19 vaccine acceptance among university students from urban was more than three times higher as compared to rural once. This was comparable with studies done in China and Ethiopia, Wolkite University.^{29,36} The possible explanation might be that a continuous and multi-dimensional community awareness through media, particularly on COVID-19 and more health information access at urban than rural area. These can result in

changing the perception, awareness and behaviors of individuals.

The odds of COVID-19 vaccine acceptance among university students who had sufficient knowledge about COVID-19 were more than two times higher than their counter parts. This was analogous with studies conducted in Prague, Czech university students, China, France, Palestinian and Gonder, Northern Ethiopia.^{27,36,40,42,43} This might be due to the fact that knowledge has influence in changing the perception, behavior, belief, health norms, and decision making power or practice of individuals and this might help students who were knowledgeable about COVID-19 to accept its vaccine.

The odds of COVID-19 vaccine acceptance among university students who had favorable intention towards COVID-19 prevention were more than two times higher than their counter parts. This was consistent with researches conducted in Japan at Dokkyo medical university, China and Palestinian.^{36,39,40} Moreover, this study identified that the odds of COVID-19 vaccine acceptance among university students who had mothers with high education level were more than three times higher than those who had no formal or lower education level. This can be explained by the fact that mothers with high education level could have better utilization of media (reading) and outweighing the risk and benefit of actions. As a result, they might influence their offspring through experience sharing discussion and this might increase the acceptance of COVID-19 vaccine by a student. This might imply that maternal education could result offspring's awareness that can increase their decision-making action including acceptance of COVID-19 vaccine.

Strengths

This study focused on prevention aspect (vaccine acceptance and associated factors) of COVID-19, the new devastating pandemic and focused on risky groups (university students) and included many departments (study areas) which increase external validity of study.

Limitations

Since the study design was cross-sectional, cause and effect could not be identified. Social desirability bias is expecting in this study. But efforts were made to manage them through pre-testing the questionnaire, training of data collectors, and supervisors on how to approach students, interviewing privately, close supervision of data collectors, and explaining the purpose of the study for the study participants.

CONCLUSION

Almost only quarters of participants were willing to COVID-19 vaccine and this was lower than the national

average in Ethiopia. The likelihood of COVID-19 vaccine acceptance was higher among participants came from urban, had mothers with post-secondary education level, sufficient knowledge about COVID-19 and favorable intention towards COVID-19 prevention. The main reasons for non-acceptance (perceived barriers) were perceived to control birth/population growth, a need to know more about the vaccine, concern on side effects, doubt on that vaccine might be the sake of politics, perceiving the vaccine is only for risky individuals and uncertainty on vaccine's effectiveness. Thus, the findings of this study suggest program managers and all stalk holders need to play a major role in implementing an assimilated approach of health education and communication campaign to solve perceived barriers of COVID-19 vaccine. Additional triangulated studies may be advisable to address all other perceived barriers against COVID-19 vaccines using large sample size.

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