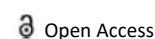




RESEARCH ARTICLE



Utilization of COVID-19 Vaccine among Health Science Students in a Resource Limited Setting

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ABSTRACT

Background: The World Health Organization (WHO) declared Coronavirus Disease-2019 (COVID-19) a global pandemic on March 11, 2020. COVID-19 infection rates are accelerating in Africa, including in Ethiopia, and the first case of COVID-19 in Ethiopia was registered on March 13, 2020. In Ethiopia, the number of COVID-19 cases in Ethiopia has continued to increase from 3 January 2020 to 17 February 2022; there have been 467,860 confirmed cases of COVID-19 with 7,429 deaths, reported to WHO.

Objectives: The study aimed to assess the utilization and predictors of COVID-19 vaccine by health science students in Mettu University, Ethiopia.

Methods: An institutional-based cross-sectional study was conducted among 423 health science students at Mettu University from February 14 to 17, 2022. STATA 14.0 was used to analyze the data. Adjusted Odds Ratio (AOR), with 95% CI and p-value <0.05 were used to declare significant factors associated with utilization of COVID-19 vaccine.

Results: In the study, a total of 385 (91.01%) health science students were included. The majority of respondents 225 (58.4%) were Male. The overall prevalence of utilization of the COVID-19 vaccine was 58.7% (95 CI:56.03, 60.1). In this study, 71.12% of the participants were good knowledge COVID-19 vaccine, and 62.6% of the respondents' were a favorable attitude toward the utilization of the COVID-19 vaccine.

Conclusion: The utilization of COVID-19 vaccine in Mettu university students was slightly high. Being female, being good knowledge, being a favorable attitude, mass media and social media information sources were positively associated with COVID-19 vaccine utilization.

ARTICLE HISTORY

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KEYWORDS

COVID-19; vaccine utilization; student

ABBREVIATIONS

AOR: Adjusted Odd Ratio; CI: Confidence Interval; WHO: World Health Organization; COVID-19: Coronavirus Disease 2019; MeU: Mettu University

Introduction

The World Health Organization (WHO) declared Coronavirus Disease-2019 (COVID-19) a global pandemic on March 11, 2020 [1]. COVID-19 infection rates are accelerating in Africa, including in Ethiopia, and the first case of COVID-19 in Ethiopia was registered on March 13, 2020. As of February 17, 2022, there had been 416,614,051 verified COVID-19 cases worldwide, with 5,844,097 deaths [2]. In Africa continent has continuously recorded cases of COVID-19 with about 7,949,522 cases and 166,912 deaths [2]. In Ethiopia, the number of COVID-19 cases in Ethiopia has continued to increase from 3 January 2020 to 17 February 2022, there have

been 467,860 confirmed cases of COVID-19 with 7,429 deaths, reported to WHO [3].

Many countries, including Ethiopia, have used a variety of measures to combat COVID-19, including declaring a state of emergency, imposing mass gathering prohibitions, implementing stay-at-home orders, and encouraging the use of personal protective equipment [4]. Vaccine development and distribution have been prioritized as part of the global strategy. Low and Middle-Income Countries (LMICs) may struggle to obtain sufficient doses for their populations. The COVAX effort was developed to close this gap by quickly procuring and delivering doses of a safe, effective, and licensed vaccine

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for equitable distribution around the world [5].

Globally, as of 14 February 2022, about 10.42 billion doses have been administered from this 30.92 million are now administered each day and at least one dose of the COVID-19 vaccination has been given to 61.9 % of the population [6]. However, only 10.6% of people in low-income countries has received at least one dose of a COVID-19 vaccine [6]. Ethiopian authorities decided to use the COVID-19 vaccine from Astra Zeneca *via* the COVAX facility [7]. Ethiopia has planned to vaccinate 20% of the population and received 2.184 million doses of COVID-19 vaccines on March 7, 2021 [7]. In Ethiopia, a total of 10,975,742 vaccine doses had been provided as of February 12, 2022 [3].

One of the most promising approaches to combating the COVID-19 epidemic is vaccination. College students' lives and education have been severely impacted by the COVID-19 pandemic [8,9]. Frontline health care workers, the elderly, and those with medical problems are prioritized for COVID-19 vaccination, according to the WHO's prioritization roadmap [10]. Medical and health science students are among the frontline health care workers that are most likely to contract COVID-19 during their clinical placement. However, vaccine utilization was reported globally among medical students. For instance the utilization of COVID-19 vaccine in Egyptian medical students was 45.9% [11], 36.1% in Saudi Arabia medical students [12], 34.9% in Jordan [13], 30.6% in Uganda [14]. Vaccine utilization has been influenced by factors such as gender [15], knowledge [16], safety and importance of the vaccine [17], and mistrust in sources relaying information about the vaccine [18,19].

As LMICs are starting to receive COVID-19 vaccines [20], It's critical to understand the factors that influence vaccination use in order to develop strategies for expanding vaccine coverage and bringing the pandemic to a close as quickly as possible. To the best knowledge of the researchers, there was limited evidence regarding the utilization of COVID-19 vaccine by college students in Ethiopia. The outcomes of this study will be useful in developing health promotion programming, messaging, and interventions to promote COVID-19 vaccine uptake among college students. Moreover, the exploration of factors related to utilization may assist health promotion researchers and practitioners to create targeted and tailored messaging, especially for students reporting utilization towards the COVID-19 vaccine. Informed by the above statement, this study assessed the utilization and predictors of COVID-19 vaccine by health science students in Mettu University, Ethiopia.

Materials and Methods

Study design, setting and period

A cross-sectional study was conducted among 423 partic-

ipants at Mettu University from February 14 to 27, 2022. The study was conducted among health science students at Mettu University. The educational system in Ethiopia consists of five years term of study for pharmacy students and four years term of study for other health science students. The study was carried out at Mettu University which is found in Mettu town. Mettu town is the city of Ilu Aba Bore zone. Currently, Ilu Aba Bora (IAB) zone has 14 districts and one administrative town.

Source and study populations

All health science students who attended their education at Mettu University were recruited as the source population while health science students who attended Mettu University and the study population consisted of those who were available during the study period and wanted.

Inclusion criteria: All health science students in Mettu University who are BSc regular students were included in the study.

Exclusion criteria: Health science students who were not present during the data collecting period and 1st-year students were excluded because the 1st-year students didn't select their department.

Study participants, sample size and sampling procedure

The study participants are health science students at Mettu University. The sample size was determined by using the single population proportion formula by assuming P=50% (since previous studies aren't found in similar study settings), a 95% level of confidence, a 5% of margin of error, and a 10% of non-response rate. Finally, a total sample size of 423 was obtained. A simple random sampling technique was used to recruit study participants after being stratified to each department. Single population formula:

$$n=(Z\alpha/2)^2 P(1-P)/d^2$$

$$n=(1.96)^2 \times 0.50(1-0.50)/(0.05)^2=384.16; \text{ with adjustment for none response rate: } 384.16 \times 10\%=38.416$$

$$\text{Total sample size becomes}=384.16+38.416=423$$

Data collection tools and procedure

Data was obtained using a self-administered questionnaire that had been pre-tested and revised after examining various works of literature. The questionnaire was prepared in the English language. The questionnaire was divided into four sections: 1) socio-demographics; 2) knowledge; 3) attitude and, 4) utilization of COVID-19 vaccine. Utilization COVID-19 vaccine was assessed as "Yes," "No," question the two alternatives provided to participants the respondent who answered yes categorized "utilized" and those who answered No "No utilized". According to this study, knowledge questions categorized those who score mean and above were categorized as adequate knowledge; those scores below the mean were

categorized as inadequate knowledge. Attitude questions also categorized those who score mean and above were categorized as “favorable attitude”; those scores below the mean were categorized as “unfavorable attitude”.

Data quality assurance

The data collection process included four data collectors and two supervisors. Three days of training was given for data collectors and supervisors on the objective of the study, data collection procedures, data collecting tools, respondent’s approach, data confidentiality, and respondent’s right before the data collection date. . Before data collection, the questionnaire was pretested on a group of 22 students at Jimma University, which is typical of our research environment. Content validity was checked by using a view of experts and corrections were made accordingly. The completeness of the questionnaire was checked every day by the supervisors. Data clean-up and cross-checking were also done before analysis.

Data management and analysis

The collected data were checked for completeness, coded, entered into Epi Data Version 4.6, and then exported into STATA™ Version 14 software for analysis. Descriptive statistics were used to describe variables (socio-demographic characteristics, participants’ knowledge, attitude regarding the COVID-19 vaccine). Binary logistic regression using enter method was used to analyze the association between individually the independent variable to the dependent variable. Variables that had an association with the dependent variable and p-value less than 0.2 in the bivariate analysis were entered into multivariable analysis to control the possible effects of confounders. In the mul-

tivariate analysis, the Hosmer and Lemeshow goodness of fit test was performed and variables that were significant on the bases of adjusted Odds Ratio (AOR), with 95% CI and p-value <0.05 considered to be the determinant factors of the utilization of COVID-19 vaccine.

Results

Socio-demographic characteristics of respondents

As shown in Table 1, a total of 385 health science students from different departments were enrolled. The majority of respondents 225 (58.4%) were male, 104 (27.0%) were third-year students, about 69 (17.9%) were nurses and 66 (17.1%) were midwife students (Table 1).

Participant’s knowledge towards COVID-19 vaccine

This study revealed that the prevalence of Good Knowledge was found to be 279 (72.5%). The majority of respondents 348 (90.3%) were aware availability COVID-19 vaccine in Ethiopia, 323 (83.9%) were COVID-19 vaccine decrease the severity of diseases, and 298 (77.4%) COVID-19 vaccination is important for the overall public health (Table 2).

Participants’ attitude towards COVID-19 vaccine

Table 3 shows that about 259 (67.3%) of the respondent had favorable attitudes respectively. Most of the respondents’ 312 (81.0%), were believes that vaccines should be made mandatory for the student, and around 76% of the students agreed with vaccines reduce the spread of the disease in the community. About 328 (85.2%) of health science students showed positive willingness to take the COVID-19 vaccine (Table 3).

Table 1. Basic sociodemographic characteristics of students on utilization of COVID-19 Mettu University South West Ethiopia, 2022.

Variable	Category	Frequency% (n=419)
Gender	Male	225(58.4)
	Female	160(41.6)
Age	18-21	96(24.9)
	22-25	211(54.8)
	>25	78(20.7)
Department	Nurse	69(17.9)
	Psychiatry	52(13.5)
	Laboratory	54(14.3)
	Midwifery	66(17.1)
	Health officer	46(12.0)
	Health Informatics	50(13.0)
	Pharmacy	48(12.5)
Class year	2 nd year	132(34.3)
	3 rd year	104(27.0)
	4 th year	80(27.8)
	5 th year	59(15.3)

Table 2. Knowledge of health science students on utilization of COVID-19 vaccines.

Knowledge about Second Dose COVID-19 vaccines?		
Variables	Category	Frequency% (n=385)
COVID-19 vaccine is available in Ethiopia	Yes	348(90.3)
	No	37(9.6)
COVID-19 vaccine is effective	Yes	277(71.9)
	No	108(28.1)
COVID-19 vaccine should be given for HCWs firstly	Yes	281(73.0)
	No	104(27.0)
COVID-19 vaccination is important for overall public health	Yes	298(77.4)
	No	87(22.6)
COVID-19 vaccination doesn't cause auto-immune diseases	Yes	271(70.4)
	No	114(29.1)
COVID-19 vaccination doesn't cause allergic reaction	Yes	255(66.2)
	No	130(33.8)
COVID-19 vaccination decrease severity of diseases	Yes	323(83.9)
	No	62(16.1)

Table 3. Attitude of health science students on utilization of COVID-19 vaccines.

Attitudes towards to COVID-19		
Variables	Category	Frequency% (n=385)
COVID-19 vaccine should be made mandatory for the student	Yes	312(81.0)
	No	73(19.0)
COVID-19 vaccination should be mandatory for the general public	Yes	311(80.7)
	No	74(19.2)
I will take the COVID-19 vaccine; if it is available in the hospital right know	Yes	328(85.2)
	No	57(14.4)
COVID-19 vaccine reduce the spread of the disease in the community	Yes	292(75.8)
	No	93(24.1)
I will encourage my family/friends/relatives to get vaccinated	Yes	243(63.1)
	No	142(36.9)
COVID-19 vaccine is safe	Yes	256(66.5)
	No	129(33.5)
COVID-19 vaccination reduces the severity of the disease	Yes	279(75.6)
	No	96(24.9)

Participant's utilization of COVID-19 vaccine

This finding declared that the overall prevalence of utilization of the COVID-19 vaccine was 226 (58.7%). However, among vaccinated, only 57 (25.2%) had fear of being infected with COVID-19, and Almost half, of the 108(47.8%) fear infecting their family with COVID-19. Among vaccinated 92(40.7%) prefer to be vaccinated Janssen vaccine (Table 4).

Factors associated with utilization of COVID-19 vaccine

After controlling confounders, being female, Attitude, Knowledge, and Source of information were significantly

associated with utilization of the COVID-19 vaccine. Being female was 2 times (AOR 2.4, 95% CI: 1.7, 4.3) more likely to utilize the COVID-19 vaccine compared to males. Participants who reported having a favorable attitude COVID-19 vaccine and adequate knowledge almost 5 times (AOR 4.7, 95% CI: 2.6, 6.2) and 4 times (AOR 4.1, 95% CI: 1.8, 4.2) were more likely utilized COVID-19 vaccine compared to than those have a poor attitude and knowledge respectively. In addition, the respondents who had to used mass media and social media as a source of information were 2.5 times (AOR 2.5, 95% CI: 1.0-4.5) and 4.6 times (AOR 4.6, 95% CI: 3.1, 6.2) more likely utilize COVID-19 vaccine respectively, compared to the counterpart (Table 5).

Table 4. Utilization of COVID-19 among health science students Mettu University South West Ethiopia, 2022.

COVID-19 vaccine related questionnaires		
Variables	Category	Frequency% (n=385)
Received necessary vaccines against COVID-19 infection	Yes	226(58.7)
	No	159(41.3)
Motivations behind receiving COVID-19 vaccine (226)		
Fear of being infected with COVID-19	Yes	57(25.2)
	No	169(74.78)
Fear of infecting family with COVID-19	Yes	108(47.8)
	No	118(52.2)
Belief in the effectiveness and safety of the vaccine	Yes	48(21.2)
	No	178(78.8)
Availability of free vaccines	Yes	13(5.8)
	No	213(94.2)
COVID-19 vaccine brand prefer to be vaccinated(226)		
Pfizer-BioNTech vaccine	Yes	24(10.6)
	No	212(89.4)
AstraZeneca vaccine	Yes	81(35.8)
	No	145(64.2)
Moderna vaccine	Yes	23(10.1)
	No	203(89.9)
Janssen vaccine	Yes	92(40.7)
	No	134(59.3)
Any brand	Yes	6(2.7)
	No	220(97.3)
Reason for not vaccinated(159)		
Fear of side effects	Yes	49(30.8)
	No	110(69.2)
Concerned about its safety	Yes	26(16.3)
	No	133(83.7)
Concerned about its efficacy	Yes	31(19.5)
	No	128((80.5)
Vaccine is not needed because I am young	Yes	21(13.2)
	No	138(86.8)
Not needed	Yes	23(14.5)
	No	136(85.5)
Lack of information about COVID-19 vaccine	Yes	9(5.7)
	No	150(94.3)

Table 5. Factors associated with utilization of COVID-19 vaccine both crude and adjusted measure of association in West Ethiopia, 2022.

Variables	Utilization (%)		COR (95% CI)	AOR (95% CI)	p-value
	Yes	No			
Sex					
Female	121(75.6)	39(24.4)	3.5(2.3-5.5)	2.4(1.7, 4.3)	0.001
Male	105(46.7)	120(53.3)	1	1	
Age					
18-21	49(51.0)	47(49)	1	1	
22-25	130(61.6)	81(38.4)	1.5(0.9-.2.5)	0.9(0.7-.1.4)	0.065
>25	47(60.2)	31(39.7)	1.4(0.8-2.7)	1.0(0.6-1.6)	0.054
Department					
Nurse	41(59.4)	28(40.6)	0.8(0.4-1.7)	0.5(0.3-1.3)	0.610
Psychiatry	29(55.8)	23(44.2)	0.7(0.3-1.5)	0.4(0.1-0.9)	0.095
Laboratory	33(61.1)	21(38.9)	0.9(0.4-1.9)	0.4(0.2-1.4)	0.152
Midwifery	37(56.1)	29(43.9)	0.7(0.3-1.5)	0.5(0.2-1.3)	0.173
Health officer	26(56.5)	20(43.5)	0.7(0.3-1.6)	0.3(0.1-1.2)	0.237
	150(94.3)	150(94.3)	150(94.3)	150(94.3)	150(94.3)
Health Informatics	29(58.0)		150(94.3)	150(94.3)	150(94.3)
21(42.0)		150(94.3)	150(94.3)	150(94.3)	150(94.3)
0.8(0.3-1.7)	0.5(0.2-1.2)	0.374	150(94.3)	150(94.3)	150(94.3)
Pharmacy	31(64.6)	17(35.4)	1	1	
Source of information mass media					
Yes	137(63.0)	51(37.0)	3.3(2.1-5.0)	2.5(1.0, 4.5)	0.001
No	89	108	1	1	
Source of information social media					
Yes	168(81.3)	14(18.7)	7.0(4.4-11.1)	4.6(3.1, 6.2)	0.002
No	78	125	1	1	
Knowledge	150(94.3)	150(94.3)	150(94.3)	150(94.3)	150(94.3)
Good knowledge	186(67.0)	93(33.0)	4.6(2.1-5.2)	4.1(1.8, 4.2)	0.001
Poor knowledge	40(37.7)	66(62.2)	1	1	
Attitude					
Favorable attitude	198(76.4)	61(23.6)	5.1(3.2-8.0)	4.7(2.6, 6.2)	0.001
Unfavorable attitude	28(22.2)	98(78.0)	1	1	

Discussion

This study aimed to assess the utilization of COVID-19 vaccine and the determinant factors associated with level of utilization focusing on health science students at Metu University. To researchers' knowledge, this study is the first one to identify the magnitude of COVID-19 Vaccine utilization and the associated factors, among the university student population. Though vaccine against COVID-19 is widely distributed and produced over the world, the extent of its utilization in addition to factors affecting the use of vaccine need to be assessed. This is also helps to encourage the use of vaccine against COVID-19. As World Health Organization (WHO) recommendation, with increment of pandemic and a constrained vaccine supply context, it is essential to ensure that all COVID-19 vaccine doses are optimally utilized to protect those at the highest risk for severe disease and death [21].

According to this study, more than half (226(58.7%)) of respondents were received vaccines against COVID-19. This implies that though the distribution of vaccines in Ethiopia may not as in other developed countries, the extent of utilization will be stated as optimum. However, the study conducted in Lebanon on the same university students were very far away from the result of this study. According to Lebanon study, 87% of university student were accepting vaccines against COVID-19 pandemic [22]. The only possible explanations for this variation from researchers perspective is that, the extent of technological development and health system will be the factors. similarly, study conducted in Bangladesh was greater than the result of this study, showing that 72.7% of students were receiving COVID-19 vaccines [23]. To be the fact, economic variations and technological development could the possible explanations for these variations. However, study conducted among University health sciences students in Northwest Nigeria was lower than the result of this study [24]. For these statements, no explanations could be obtained from researchers viewpoints.

Variables that were associated with utilization of vaccine against COVID-19 also assessed. Of this, sex, attitude, knowledge and source of information are the most determinant factors. Thus being Female was 2 times (AOR 2.4, 95% CI: (1.7-4.3)) more likely to utilize COVID-19 vaccine compared to males. The result of this study was similar with study conducted in France among University Students [25]. Especially in Ethiopia, females may not treat equally as males that might expose them for various problems. Hence that, the more they may join health facilities, the more they might be aware of vaccine of COVID-19. However, according to the study conducted in Ohio, males were higher to receive COVID-19 vaccines when compared to females. That study implied that, odds of COVID-19 vaccine acceptance were lower for: females

compared to males (OR 0.58, 95% CI: 0.47–0.71; P=0.001) [26]. A lot of possible explanations will be raised for these variations. Of this, the extent of study participants might be the cause for the variation, because the study conducted in Ohio was among residents, not restricted university students as this study. Additionally, vaccine distribution status and economic development of Ohio and Ethiopia is definitely different. Moreover, study supported that Female students seemed to be prone to vaccine defiance and hesitancy [23].

Attitudes have also found to be the determinant factors in utilization of COVID-19 vaccine among university students. Accordingly Participants who reported having favorable attitude towards COVID-19 vaccine were about 5 times (AOR 4.7, 95% CI: 2.6-6.2) more likely utilize COVID-19 vaccine as compared to those have poor attitude. In similar with this study, study conducted in Bangladesh stated in same way. According to that study, understanding the students' attitudes toward the COVID-19 vaccines will helps to develop appropriate policies for a successful vaccination campaign [23]. Having adequate knowledge about COVID-19 vaccine determines the extent of vaccine utilization according to this study result. This is because, when students get sufficient knowledge of vaccine, they are more likely to utilize vaccine against COVID-19. As a result, students with who had adequate knowledge about COVID-19 vaccine were 4 times (AOR 4.1, 95% CI: 1.8, 4.2) more likely utilize COVID-19 vaccine compared to than those have poor knowledge. In similar with this findings, study conducted in Lebanon revealed that a high level of knowledge about COVID-19 disease and vaccine resulted in lower odds of vaccine resistance among students [27]. To the point, this study explained that as knowledge increased the magnitude of vaccine utilization will be increased. In addition to that, students having inadequate knowledge, and negative perceptions and attitudes toward the vaccine were susceptible to vaccine hesitancy and resistance decreasing utilization of vaccine against COVID-19 [23]. The source of information directly related with utilization of vaccine against COVID-19. Students who receives information about COVID-19 vaccines from healthcare workers were about 1.5 times (AOR 1.5, 95% CI: 0.3, 3.1) more likely utilize COVID-19 vaccine compared to than those receives information from teachers. In similar manners, studies revealed that, Source of information that Medicare beneficiaries used to learn about COVID-19 may play a critical role in shaping perceptions of COVID-19 severity and attitudes toward getting a COVID-19 vaccine [22-29].

Despite our best attempts to minimize the possible shortcomings of this survey, this study does have certain limitations. The study was limited to the students of a government university only, and therefore, there is the question of the representativeness of the finding to all students.

And also shares the limitations of establishing cause-effect relationships because of a cross-sectional study design. Furthermore, the data presented in this study are self-reported and thus may be subject to recall bias.

Conclusion

Utilization of COVID-19 vaccine in MeU student was slightly high. Being female, being good knowledge, being favorable attitude, mass media and social media information source was positivity associated with COVID-19 vaccine utilization. As a result, more effort should be taken to improve MeU students' awareness and attitudes about utilization of COVID-19 vaccine to protect both student and community from this pandemic.

Ethical Consideration

Ethical clearance was obtained from the ethical review board with Ref No: ARCSV/227/2022 of a college of health sciences, Mettu University. A supporting letter was obtained from the department of health informatics. Oral consent was obtained from the study participants after telling the objective of the study. Informed consent was obtained from each study participants after telling the objective of the study. The study participants they were informed about the benefits of the study. If they feel discomfort on the interview they were informed that they can stop at any time. In order to keep confidentiality assurance to the study participants was provided on any information provide by them. The data collection procedure was anonymous and their privacy was kept.

Data Sharing Statement

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

Ethics Approval and Consent to Participate

The study protocol was reviewed and approved by the ethical review board of the Mettu University, and informed consent was obtained from each study participant. Names of participants and other personal identifiers were not included in the data collection tool. The participants' consent included the publication of anonymous responses. This study was conducted in accordance with the Declaration of Helsinki.

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Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising

it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

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