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Covid-19 vaccine uptake and associated factors among health science University students in northeastern Ethiopia, a cross-sectional study

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ABSTRACT

The aim of this study is to assess COVID-19 vaccine uptake and associated factors among health science students at Wollo University, Northeast Ethiopia. Institution based cross-sectional study was conducted among 403 health science students at Wollo University from 1 to 15 July, 2022. The data was collected using a structured self-administered questionnaire and analysis was performed using SPSS version 26. Adjusted Odds Ratio (AOR), with 95% CI and p-value <.05 were used to declare factors significantly associated with COVID-19 vaccine uptake. The prevalence of COVID-19 vaccine uptake was 23.3% (95% CI: 19.2, 27.4). Being in the age category of 22–25 years old (AOR = 0.392, 95% CI (0.197, 0.780)), being >25 years old (AOR = 0.253, 95% CI (0.086, 0.741)), have a known disease (AOR = 0.202, 95% CI (0.044, 0.935)), source of income is self (AOR = 2.504, 95% CI (1.104, 5.677)) and screened for COVID-19 disease (AOR = 4.278, 95 % CI (2.418, 7.570)) before are significantly associated with uptake of COVID-19 vaccine. In conclusion, majority of the respondents didn't take COVID-19 vaccine with age greater than 22 years and have a known disease found to be negative predictors of COVID-19 disease.

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Covid-19; vaccine; uptake; associated factors; health science students

Introduction

Coronavirus disease 2019 (COVID-19) is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2).[1] It was declared by World Health Organization (WHO) as a global pandemic on 11 March, 2020. Since its emergence on 12 December, 2019 as of 28 March 2022, COVID-19 infects 308,458,509+ confirmed cases, 5,492,595+ deaths globally. Of this, 7,664,386+ confirmed cases and 159,065+ deaths were reported in Africa.[2] In Ethiopia, from 13 March, 2020 in which the first case of COVID-19 was registered, to 21 September 2022, there have been 493,456 confirmed cases and 7,572 deaths. As of 30 July 2022, a total of 52,509,414 vaccine doses have been administered to the general population.[3] COVID-19 pandemic spread rapidly since its emergence resulting in a global health, social, economic, and political crisis.[4]

COVID-19 vaccines are important to build strong protection against serious illness meaning that it decreases the severity of disease. Similarly, COVID-19 vaccine decreases hospitalization and death. There is also some evidence that being vaccinated will make it less likely that you will transmit to others.[5,6]

According to WHO prioritization roadmap, the elderly (aged >60 years old), those with chronic disease like diabetes, hypertension, cardiovascular disease, respiratory disease, and health care workers are prioritized for COVID-19 vaccination.[7] Medical and health science students are among the vulnerable groups that are at high risk to be contracted by COVID-19 during their clinical practice. However, low COVID-19 vaccine utilization among the medical and health science students was reported globally. For instance, uptake of COVID-19 vaccine in Kazakhstan was 2% among medical students,[8] Mid-west 50% among medical students,[9] in China 98% and 50% among adolescents (12–17 years old) and the general population, respectively,[10,11] in Mettu University 58.7% among medical and health science students,[12] and in south Gondar zone 18.7% among the general population.[13]

There are numerous factors that affect utilization of COVID-19 vaccine. The most common of these are inconsistent approaches and changing policies, safety issues, side effects, effectiveness, trust, access to information, efficacy, political roles, conspiracy beliefs and fear and anxiety.[14–16] The immediate goal of the global COVID-19 vaccination strategy is to minimize deaths, severe disease and overall disease burden, curtail the health system impact, fully resume socio-economic activity, and reduce the risk of new variants.[17] Combating misinformation, provider recommendation, workplace vaccination, and home delivered vaccination and motivational interviewing are some of the strategies that promote vaccine uptake.[18,19]

Currently, in Ethiopia, COVID-19 vaccine is administered to the general population. It's vital to understand the level of vaccination and the factors that influence vaccine use in order to develop strategies that promote vaccine coverage and

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decrease the infection rate of the pandemic. As far as the researcher's knowledge, there was limited evidence regarding the uptake of COVID-19 vaccine and associated factors among medical and health science students in Ethiopia.

The findings of this study are important in developing strategies that promote COVID-19 vaccine uptake among University students. Therefore, the aim of this study is to assess uptake of COVID-19 vaccine and associated factors among Wollo University health science students.

Material and methods

Study design and period

Institution-based cross-sectional study was conducted from 1 to 15 July, 2022.

Study area

The study was conducted at Wollo University, Dessie campus. It is located in Dessie town, 401 Km to Northeast from capital city of Ethiopia, Addis Ababa. There are 6 colleges and four schools in Wollo University Dessie campus. At the time of the study there were 1500 health science students who were attended regular undergraduate program.

Source and study population

The source population was all students from College of Medicine and Health Science who were enrolled in regular stream and undergraduate program.

The study population was students of college of medicine and health science of the campus who were available during the study period.

Eligibility criteria

All undergraduate regular health science students of Wollo University Dessie campus were included. Whereas, students who are freshman, had visual problem and weren't available during data collection due to clinical practice was excluded.

Sample size & sampling procedures

The sample size was determined by using single population proportion formula.

$$n = \frac{(Z\alpha/2)2 \times (1 - P)}{d2}$$

where:

n = the required sample size

Zα/2 = the standard normal distribution score at (100-α) confidence level which is 1.96 for 95% confidence level.

P = the population proportion which is taken 58.7%in a similar study conducted at Mettu University.[12]

d = the margin of error for the population proportion, taken to be 0.05

$$n = \frac{1.962 \times 0.587 \times (1 - 0.587)}{0.0025} = 376$$

Adding 10% non-response rate the total sample size becomes 410.

Participants were recruited from July 1–15, 2022. Systematic sampling was employed to select each study participant and allocated proportionally to each department.

Variables of the study

Dependent variable

- Covid-19 vaccine uptake

Independent Variables

- Socio-demographic variables (sex, age, source of income, year of study and field of study)
- Hearing about COVID-19 vaccine
- Presence of known disease, previous history of having Covid-19
- History of screening for COVID-19 and know anyone who was infected/hospitalized/died due to Covid-19

Operational definition

Uptake of COVID-19 vaccine – defined as the number of participants who received a certain vaccine dose (at least one COVID-19 vaccine dose) during the study period. It was measured by the closed-ended question as "Have you been vaccinated with any of COVID-19 vaccines at least once currently?" (Yes/No). Those participants who have taken the vaccine answered as "Yes" and those who were not vaccinated answered as "No" to the question inquiring the vaccine uptake.[13]

Data collection tools and procedure

The data were collected using a self-administered structured questionnaire adapted from previously published articles[20–22] and modified to achieve objective. The questionnaire had items regarding socio-demographic background, knowledge about COVID-19 disease, awareness toward COVID-19 vaccine and reason for taking and not taking the vaccine. A pretest was done in 5% of the sample at Woldia University among health science students to ensure the validity of the data collection instruments. Data were collected by five trained postgraduate pharmacy students.

Data quality control

The questionnaire was translated into Amharic language and back to English by language experts to ensure consistency of translations. The data collectors were given half-day training on the objective of the study, data collection tool and other technical issues in the data collection process. There were close supervision and regular checkup of the completeness of the questions

throughout the data collection period by the principal investigator.

Data processing and analysis

After the completeness of questionnaires was checked, data entry and analysis was performed using SPSS version 26. Exploratory analysis was performed to check missing values, outliers and inconsistency across data set. Descriptive analysis like frequencies, percentages and summary measures was performed and presented in tables. Binary logistic regression was used to measure the association between independent variables and vaccine uptake. First bivariate logistic regression was performed to identify candidate variables for multiple logistic regressions. Those variables with p-value of below 0.2 were fitted to multiple logistic regressions. Model fitness was tested using the Hosmer and Lemeshow's test and it was insignificant. Variables with a p-value of below 0.05 were considered statistically significant factors. Finally, the crude and adjusted odds ratios with the respective 95% confidence intervals were reported and interpreted.

Ethical consideration

Ethical clearance was obtained from the ethical review committee of college of medicine and health sciences, Wollo University with ethical approval number CMHS 384/20/14. During the data collection each study participant were informed about the purpose, anticipated benefits, harms/discomforts, that their name was not used and confidentiality of information was kept. After doing so, oral consent was asked for their willingness for participation and only those who are voluntary were included.

Results

Socio-demographic characteristics

A total of 403 health science students were participated in the study with a response rate of 98.3%. Of the participants, 130 (32.3%) were females and 157 (39%) were in the age category 20–21 years. Majority of the respondents, 300 (74.4%) get their income from family and 94 (23.3%) students were from department of pharmacy. Regarding year of study, 110 (27.3%) study participants were second year, 141 (35%) were third year and the rest 152 (37.7%) were fourth year and above (Table 1).

Table 1. Socio-demographic characteristics of health science students of Wollo University, 2022 ($n = 403$).

Variables	Category	Frequency	Percent
Age category	20–21	157	39.0
	22–25	130	32.3
	>25	116	28.8
Sex	Female	130	32.3
	Male	273	67.7
Source of income	Family	300	74.4
	Self	103	25.6
Department	Pharmacy	94	23.3
	Public health	105	26.1
	Nursing	60	14.9
	Medical laboratory	31	7.7
	Midwifery	36	8.9
	Environmental health	42	10.4
	Anesthesia	35	8.7
Academic year	Second year	110	27.3
	Third year	141	35.0
	Fourth year and above	152	37.7
Having known disease	Yes	34	8.4
	No	369	91.6

Knowledge toward Covid-19 disease

About 357 (88.6%) study participants said that death is the common complication of COVID-19 whereas 257 (63.8) participants reported that pneumonia is the most common complication of COVID-19 disease. Of all the WHO recommended preventive measures, most 367 (91.1%), 360 (89.3%), 350 (86.9%) and 348 (86.6%) of the study participants mentioned hand washing, wearing face mask, using sanitizer and taking COVID-19 vaccine respectively (Table 2).

Table 2. Knowledge of students of college of medicine and health science toward Covid-19 disease, 2022.

Variables	Category	Frequency	Percent
Causative agent	Fungus	4	1.0
	Bacteria	7	1.7
	Virus	388	96.3
	Other*	4	1.0
Symptoms of COVID-19	Cough	348	86.4
	Sneezing	318	78.9
	Fever	368	91.3
	Shortness of breath	327	81.1
	Loss of odor	160	39.7
	Diarrhea	71	17.6
A sick person can transmit COVID-19 disease	TRUE	368	91.3
Asymptomatic person can transmit COVID-19 disease	TRUE	303	75.2
Children are the most susceptible groups for COVID-19	TRUE	170	42.2
Disabled people are most susceptible groups for COVID-19	TRUE	54	13.4
Elderly people are the most susceptible groups for COVID-19	TRUE	356	88.3
Chronically ill people are susceptible groups for COVID-19	TRUE	213	52.9
Health workers are the most susceptible groups for COVID-19	TRUE	203	50.4
Pneumonia is the common complications of COVID-19	TRUE	257	63.8
Death is the common complications of coronavirus disease	TRUE	357	88.6
Which preventive methods are recommended by WHO?	Hand washing	367	91.1
	Alcohol rub	350	86.8
	Facemask	360	89.3
	Quarantine	218	54.1
	Antibiotics	165	40.9
	Vaccination	349	86.6
	Balanced diet	193	47.9
	Avoid crowded area	317	78.7
Previous history of COVID-19 disease	Yes	22	5.5
	No	177	43.9
	I don't know	204	50.6
Screened for COVID-19	Yes	119	29.5
	No	284	70.5

Others*. Evil spirit.

Table 3. Awareness of health science students toward Covid-19 vaccine, Wollo University, 2022 ($n = 403$).

Variables	Category	Frequency	Percent
Do you heard about COVID-19 vaccine?	Yes	368	91.3
	No	35	8.7
What do you know about COVID-19 vaccine currently given?	More than 85% effective	172	42.7
	All group of population can took	163	40.4
	Side effect well known	94	23.3
	Given in two rounds	121	30.0
COVID-19 vaccine is not given for	Elderly	97	24.1
	Children <12 years	218	54.1
	People with chronic disease	105	26.1
Do think you will get COVID-19 after vaccinated?	Yes	171	42.4
	No	232	57.6

Table 4. Reasons for vaccine uptake of health science students of Wollo University, 2022 ($n = 403$).

		Frequency	Percent
Reasons for taking COVID-19 vaccine	If not vaccinated, transmit to family	44	10.9
	Best prevention method	56	13.9
	Fear of being sick	24	6.0
	Other took	6	1.5
	Health professionals recommend	14	3.5
	A person I know took	2	0.5
Reason for not taking COVID-19 vaccine	Fear of side effect	68	16.9
	Biological gun	53	13.2
	Vaccine hesitancy	159	39.5
	Developed in short time so not reliable	64	15.9
	No enough information	125	31.0
	vaccine not effective	34	8.4
	I prefer other preventive Measures	48	11.9
	Vaccine itself cause COVID-19	12	3.0
	No COVID-19	12	3.0

Awareness toward Covid-19 vaccine

About 35 (8.7%) students reported as they had not heard about COVID-19 vaccine. Only half of the respondents 218 (54.1%) said that COVID-19 vaccine is not to be given for Children < 12 years (Table 3).

Reasons of vaccine uptake

Of the vaccinated students, more than half 56 (13.9%) of the students reported that the reason behind their vaccination was vaccine is the best prevention method. About 44 (10.9%) respondents vaccinated because they afraid of transmit to family if they will get COVID-19 disease. Of the not vaccinated 159 (39.5%), 125 (31%) and 68 (16.9%) respondents didn't utilize COVID-19 vaccine because of vaccine hesitancy, having no enough information regarding the vaccine and fear of vaccine side effect, respectively (Table 4).

Covid-19 vaccine uptake

More than two-third 309 (76.7%) of the participants didn't take COVID-19 vaccine whereas 94 (23.3%) participants took COVID-19 vaccine.

Factors associated with vaccine uptake

In the bivariate logistic regression age category, source of income, field of study of the respondents, have known disease, heard about COVID-19 vaccine, ever have Covid-19, Screened for Covid-19, know any one infected/hospitalized/died were significantly associated with vaccine utilization of health science students a at p-value of 0.2.

In multiple logistic regression, age category 20–21 (AOR, 0.392 95%CI 0.197, 0.780), age category >25 (AOR 0.253, 95% CI 0.086, 0.741) have known disease (AOR 0.202, 95% CI 0.044, 0.935) were negatively associated with COVID-19 vaccine

Table 5. Factors associated with uptake of Covid-19 vaccine among health science students, 2022 ($n = 403$).

		Vaccine uptake			
Variables	Category	No	Yes	COR (95% CI)	AOR (95% CI)
Age category	20–21	109	47	1	1
	22–25	189	19	0.382 (0.220,0.664)	**0.392 (0.197,0.780)***
	>25	105	28	0.640 (0.353, 1.161)	**0.253 (0.086,0.741)***
Source of income	Family	239	61	1	1
	Self	70	33	1.847 (1.120, 3.046)	**2.504 (1.104, 5.677)***
Department	Pharmacy	76	20	0.888 (0.350, 2.251)	
	Health officer	92	13	0.477 (0.179, 1.270)	
	Nursing	34	26	2.581 (1008, 6.606)	
	Medical laboratory	23	8	1.174 (0.380, 3.622)	
	Midwifery	26	10	1.298 (0.443, 3.801)	
	Environmental Health	31	9	0.980 (0.332, 2.894)	
	Anesthesia	27	8	1	
Have known disease	Yes	32	2	0.188 (0.044, 0.801)	**0.202 (0.044, 0.935)***
	No	277	92	1	1
Heard about COVID-19 vaccine	Yes	286	82	0.550 (0.262, 1.152)	
	No	23	12	1	
Ever have COVID-19	Yes	14	8	2.418 (0.948, 6.165)	
	No	130	47	1.530 (0.944, 2.479)	
	I don't know	165	39	1	
Screened for COVID-19	Yes	64	55	5.399 (3.294, 8.848)	**4.278 (2.418, 7.570)***
	No	245	39	1	
Know any one infected/hospitalized/died	Yes	129	54	1.884 (1.181, 3.006)	
	No	180	40	1	

*Statistically significant $p \leq .05$.

uptake whereas source of income is self (AOR 2.504, 95%CI 1.104, 5.677) and screened for COVID-19 (AOR 4.278, 95% CI 2.418, 7.570) were positively associated with COVID-19 vaccine uptake of health science students at 0.05 significant level (Table 5).

Discussion and conclusion

The finding from this study showed that 23.3% respondents were vaccinated at the time of the study. This finding is similar to a study conducted in South Gondar Zone (Nega Dagnew Baye et al., 2022).[13] Whereas it is higher than a study conducted in Kazakhstan (Aidos K. Bolatov et al., 2021).[8] The possible justification for this may be the study in Kazakhstan was conducted as vaccines are developed in which so many rumors regarding vaccine safety and effectiveness was there. In addition to this many people didn't want to be the first. On the other hand, higher vaccine uptake was reported from a study conducted in Mettu University (Ahmed MH et al., 2022).[12] The possible justification for this variation may be a study in Mettu University was conducted when infection rate of COVID-19 and government concern toward COVID-19 was relatively high.

The current finding revealed that becoming in the age group between 22 and 25 years old was negatively associated with COVID-19 vaccine uptake. Those health science students whose age is between 22 and 25 years old were 61.8% less likely to take COVID-19 vaccine when compared to participants aged between 20 and 21 years old. Similar to this, study participants whose age is > 25 years old were negatively associated with COVID-19 vaccine uptake. Those respondents whose ages greater than 25 were 74.7% less likely to take COVID-19 vaccine when compared to participants whose age is 20–21 years. The possible justification to this association might be due to mostly as age increases people become resistant to new things and they don't want to be the first. This implies that there should be strategies for these age groups to increase vaccine uptake.

Additionally, this study showed that having known diseases was negatively associated with vaccine uptake among health science students. Those respondents who have known disease were 79.8% less likely to take COVID-19 vaccine when compared to participants without known disease. The negative association between having known disease and vaccine uptake is not unexpected because most people with known disease assume that they are immune-compromised even those have known disease which doesn't affect immune system. As a result of this, they are afraid that if they took COVID-19 vaccine, they might get COVID-19 disease. Therefore, there should be targeted awareness creation program for this group of population based on prior evidence regarding the safety profile of COVID-19 vaccines by supporting with investigations conducted among populations with known disease who took COVID-19 vaccine.

Health science students whose income source is self were positively associated with COVID-19 vaccine uptake. Those respondents who get their income by their own were 2.5 times more likely to uptake COVID-19 vaccine when compared to respondents who get their income from family. The possible justification for this association may be, those respondents who get their income by their own didn't want to expend out of pocket cost due to hospitalization if they get COVID-19 disease.

This study revealed that those study participants who have been screened for COVID-19 disease were positively associated with COVID-19 vaccine uptake. Those respondents who have been screened before were 4.3 times more likely to take COVID-19 vaccine when compared to participants who didn't screened for COVID-19 disease which is different from a study conducted in South Gondar Zone, Ethiopia.[13] The possible justification for this variation might be a study conducted in south Gondar zone was done among the general population. The positive association between screened for COVID-19 and vaccine uptake might be due to respondents who have been screened are more concerned about COVID-19 disease and its vaccine. From this finding, we understood that health science students who weren't screened for COVID-19 should be targeted so as to improve COVID-19 vaccine uptake of health science students.

Limitation: From the cross-sectional nature of the study, it lacks temporality.

Generally, in the current study, more than two-third of the participants didn't took COVID-19 vaccine. The study evidenced that, age greater than 22 years and having known disease have a negative association with vaccine uptake. Whereas source of income from self and screened for COVID-19 disease were a positive predictors of COVID-19 vaccine uptake among health science students.

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