


RESEARCH PAPER



# Knowledge and attitude toward the second round of COVID-19 vaccines among teachers working at southern public universities in Ethiopia

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## ABSTRACT

About 1.9 million people in Ethiopia have received a first dose of COVID-19 vaccine, which are given to frontline health care workers and university instructors through a campaign. After healthcare workers, teachers at all levels in Ethiopia are assumed to be at a higher risk of exposure to COVID-19. An institution-based cross-sectional study design was used. Simple random sampling was used to select participants. Data were collected using a structured, self-administered questionnaire. Logistic regression analysis was conducted for all variables, and a  $p$ -value  $< 0.05$  at 95% CI was considered statistically significant. Overall, 60.8% and 79.7% of participants had good knowledge of and positive attitudes toward a second round of COVID-19 vaccines, respectively. Age (AOR = 1.51 [95% CI = 1.003–3.63]), profession (AOR = 1.402 [95% CI = 1.107–3.003]), work experience (AOR = 1.509 [95% CI = 1.151–2.283]), and chronic diseases (AOR = 2.142 [95% CI = 1.337–3.092]) were predictor variables for knowledge about the second round of COVID-19 vaccines. Sex (AOR = 1.386 [95% CI = 1.018–2.763]), marital status (AOR = 4.180 [95% CI = 2.397–6.989]), profession (AOR = 1.102 [95% CI = 1.008–3.123]), work experience (AOR = 1.211 [95% CI = 1.029–2.877]), and chronic diseases (AOR = 6.110 [95% CI = 4.892–10.661]) were predictor variables for attitudes toward a second round of COVID-19 vaccines. Generally, knowledge and attitudes toward the second round of COVID-19 vaccines among instructors were low. Thus, health education and communication are very crucial.

## ARTICLE HISTORY

Received 13 October 2021  
Revised 19 November 2021  
Accepted 13 December 2021

## KEYWORDS

COVID-19 vaccine;  
knowledge; attitude;  
teachers; second dose

## Introduction

Coronavirus disease 2019 (COVID-19) is an emerging respiratory disease caused by a single-strand, positive-sense ribonucleic acid (RNA) virus.<sup>1</sup> The COVID-19 pandemic has imposed a heavy disease burden around the world due to the absence of specific antiviral treatments.<sup>2,3</sup>

The world is witnessing a major global humanitarian disaster due to the spread of COVID-19, which has affected all aspects of life across the planet.<sup>4,5</sup> Despite countries' strict precautions and controls to measure the implemented preventive techniques, the spread of the disease did not slow, which shows that such preventive measures may not be sufficient to halt the spread of COVID-19.<sup>4,5</sup>

Immunization is one of the most successful and cost-effective health interventions for preventing infectious diseases, including COVID-19. Therefore, vaccine development and deployment are the most promising health intervention strategies for mitigating the spread of COVID-19.<sup>6,7</sup> Thus, huge efforts by the scientific community and pharmaceutical industry – backed by government support – were directed toward developing efficacious and safe COVID-19 vaccines.<sup>8</sup>

African countries are at a higher risk of disease spread due to limited health infrastructure and training; their inability to promptly obtain vaccines further increases the risk of disease spread. Not only have many developed countries ordered most

of the vaccine supply, but vaccine-related costs and transportation issues may further delay vaccinations for African people until late 2021 or early 2022.<sup>9</sup>

Several studies have identified that knowledge of and attitudes toward COVID-19 vaccines determine their acceptance.<sup>10–12</sup> Recently, a study revealed a new hot topic in research in Ethiopia: researching knowledge of and attitudes toward vaccination to try to reduce disease transmission rates.<sup>13</sup>

Knowledge about COVID-19 vaccines was affected by the following factors: asymptomatic COVID-19 infections, household income, a high risk of COVID-19, age, beliefs about vaccines, education level, and religion.<sup>14,15</sup> Vaccine history, the perceived impact of COVID-19, understanding of vaccine immunity, political ideology, household income, and information about the vaccine were identified as the factors associated with attitudes toward COVID-19 vaccination.<sup>16,17</sup>

Previous studies showed that knowledge of and attitudes toward COVID-19 vaccines ranged from 31.6% to 86.2% in Africa, Europe, India, England, and France.<sup>13,15,18</sup>

According to study done in Libya, the respondents acknowledged that vaccines are essential for children's health, and 86% believed that vaccinations could reduce morbidity and mortality. Furthermore, 94.2% believed that finding an effective vaccine was possible and would reduce the COVID-19 burden. However, 14.9% believed that vaccination benefits outweighed the risks.<sup>19</sup>

COVAX, the worldwide effort working toward equal access to COVID-19 vaccines, is estimated to hold doses for about 20% of the Ethiopian population.<sup>20</sup> If these are all the COVID-19 vaccine doses available to the population of Ethiopia, vaccines may be distributed based on risk level.<sup>21</sup>

Public media sources recently revealed that about 1.9 million people in Ethiopia received their first dose of a COVID-19 vaccine. First doses of COVID-19 vaccines were given to frontline health care workers and university instructors through a campaign.<sup>22</sup> Because they have frequent contact with many people, health providers, teachers at all levels, bank employees, telecom workers, and bus drivers in Ethiopia are assumed to be at a higher risk of contracting COVID-19 than other segments of society.<sup>23</sup>

Therefore, it is mandatory to understand teachers' knowledge of and attitudes toward second COVID-19 vaccine doses. Additionally, there have been no prior studies investigating the knowledge of and attitudes toward second COVID-19 vaccine doses among teachers in public universities in Ethiopia. This study examines the knowledge of and attitudes toward second COVID-19 vaccine doses among teachers in public universities.

## Methods and Materials

### Study design, period, and setting

The institution-based cross-sectional study design was conducted among teachers working at public universities in South Nations and Nationalities and Peoples Region Southwest Ethiopia from June 1, 2021 to July 30, 2021. The capital city of the region (Hawassa) is located 271 km south of Addis Ababa, the capital city of Ethiopia. There are nine public universities in the region. These are Arba Minch University, Jinka University, Worabe University, Mizan Tepi University, Wolkite University, Wolaita Sodo University, Dilla University, Bonga University, Wachamo University.

### Source and study population

The source population was generated by all of the teachers who work at public universities in the southern region. Teachers who work in selected public universities in the southern region were the study population.

### Inclusion and Exclusion Criteria

All teachers working at public universities in the southern region during the study period were included, whereas teachers who were unable to respond were excluded from this study.

### Sample size and sampling procedure

The required sample size was calculated using the single population proportion formula ( $n = Z^2 p (1-p)/d^2$ ) with an assumption of 95% confidence interval (CI), 5% margin of error, 50% proportion of knowledge, and attitude toward the second dose of COVID-19 vaccine among teachers as assumptions (because there has been no study done so far). The sample size was found to be 384. Finally, by adding a 10% non-response rate,

the final sample size was 422. The study was carried out in four public universities (Wolaita Sodo University, Arba Minch University, Wolkite University, and Dilla University) after random selection from nine universities in the southern region. There were 1836, 2261, 1682 and 2180 academic staffs in Wolaita Sodo University, Arba Minch University, Wolkite University and Dilla University respectively in 2021. Initially samples were proportionally allocated to those four universities. Next, list of academic staffs were taken from universities' human resource directorate offices. Finally, a simple random sampling method by using table of random number was employed to select the study participants.

### Data collection tools and procedures

A structured, self-administered questionnaire was designed for data collection. The questionnaire had four parts. The first part comprised questions regarding personal socio-demographic information, the second part consisted of health-related information, and the other two parts covered knowledge and attitude related to the second dose of the COVID-19 vaccines. The questionnaire was adopted and modified from different works of literature.<sup>21-24</sup> It was prepared in the English language. Four data collectors for graduate assistant positions out of the selected universities were assigned.

### Quality control measures

Data quality was controlled via conducting a pretest on 5% of the sample size in Wachamo University before actual data collection to ensure that the respondents could understand the wording and skip the order of the questions sensibly. Findings from pretesting of the questionnaires were part of training and the concerns identified were clarified. The correction of the questionnaire was done after pretesting. Training was given for data collectors for two days on the methods of administering and gathering the questionnaire. The completeness of the questionnaire was also checked before data entry.

### Data processing and analysis

The collected data were coded and entered into Epi-Data version 3.1 and then was exported to SPSS version 25.0 for analysis. Descriptive statistical analysis was done by computing summary statistics like frequency, mean, percentages, and standard deviations, and the results were presented in tables and graphs. Binary logistic regression was done to assess the crude relationship between the independent variables and the dependent variable. All variables having a  $P$ -value  $\leq$  of 0.2 were considered as candidates for multivariable logistic regression to control for possible confounding effects. Multivariable logistic regression was applied to see the independent effect of each variable on the outcome variable. Multi-collinearity among the independent variables was checked using VIF and the Hosmer and Lemeshow tests were used to assess models' goodness of fit. The association of final results were presented based on Adjusted Odds Ratio (AOR) at 95% confidence level and  $p$ -value  $<$  0.05.

## Operational definition

Comprehensive knowledge about the second dose of the COVID-19 vaccine was computed by summing up all relevant five knowledge-related questions about the second dose. The correct answer for each item was scored “1,” and the incorrect answer was scored “0.” Accordingly, respondents who scored greater than or equal to the mean value of the sum of knowledge assessment questions were thought to have good knowledge, and respondents who answered less than the mean value of the sum of knowledge assessment questions were thought to have poor knowledge<sup>22–25</sup> Attitude toward the COVID-19 vaccines.

The questions regarding attitude were scored out of six (with a minimum score of four and a maximum score of 18). The score of the attitude was based on a 3-point scale, on which a score of 1 to 3 was given, from disagree to agree. Accordingly, respondents who scored greater than or equal to the mean value of the sum of attitude-related questions were thought of as having a positive attitude, and respondents who answered less than the mean value of the sum of attitude-related questions were thought of as having a negative attitude.<sup>21–24</sup>

## Results

### Socio-demographic characteristics of respondents

A total of 418 participants were included in the study, with a response rate of 99%. The mean age of participants was 35.57 (SD±6.219) years. Two hundred fifty (59.8%) and 132 (31.6%) of the study participants were in the age groups of 30–39 and 40–49 years old, respectively. The majority of the participants, 307 (73.4%), were males. Three hundred forty-nine (83.5%) of them were married. The majority of the 253 participants (60.5%) had health-related professions. Regarding educational status, 302 (72.2%) of participants were masters or equivalent specialists. Concerning the work experience of participants, 186 (44.5%) and 132 (31.6%) of them were working for 3–5 years and 5–10 years, respectively. The mean average monthly income of participants was 10625.63111.7 ETB and the majority (323, 77.3%) of the gain was from 5000–10,000 ETB monthly. About 405 (96.9%) of the study participants had less than four family sizes (Table 1).

### Health-related characteristics of participants

Regarding health-related characteristics of participants, the majority of them perceived they were healthy, did not smoke, had no chronic diseases, and were not overweight, 86.4%, 90%, 92.6%, and 79.9%, respectively. Of the majority, 372 (89%) of participants were tested for COVID-19. Of those tested, 12.6% were positive (Table 2).

### Knowledge about second dose COVID-19 vaccine

Table 3 depicts the level of knowledge participants had about the second dose of the COVID-19 vaccine among teachers working at southern public universities. Regarding the overall level of

**Table 1.** Sociodemographic characteristics among teachers working at southern public universities in Ethiopia, 2021 (N = 418).

| Variables              | Category                        | Frequency | Percent |
|------------------------|---------------------------------|-----------|---------|
| Age                    | 20–29                           | 25        | 6%      |
|                        | 30–39                           | 250       | 59.8%   |
|                        | 40–49                           | 132       | 31.6%   |
|                        | 50–59                           | 11        | 2.6%    |
| Sex                    | Male                            | 307       | 73.4%   |
|                        | Female                          | 111       | 26.6%   |
| Marital status         | Married                         | 349       | 83.5%   |
|                        | Unmarried                       | 69        | 16.5%   |
| Education              | Degree                          | 25        | 6%      |
|                        | Masters or equivalent specialty | 302       | 72.2%   |
|                        | Ph.D. or equivalent specialty   | 91        | 21.8%   |
| Average Monthly Income | 5000–10000 ETB                  | 323       | 77.3%   |
|                        | ≥10000 ETB                      | 95        | 22.7%   |
| Profession             | Health-related                  | 253       | 60.5%   |
|                        | Non-health-related              | 165       | 39.5%   |
| Religion               | Orthodox Christian              | 256       | 61.2%   |
|                        | Muslim                          | 44        | 10.5%   |
|                        | Protestant                      | 99        | 23.7%   |
|                        | Others                          | 19        | 4.5%    |
| Family size            | <4                              | 405       | 96.9%   |
|                        | ≥4                              | 13        | 3.1%    |
| Work experience        | 1–3                             | 63        | 15.1%   |
|                        | 3–5                             | 186       | 44.5%   |
|                        | 5–10                            | 132       | 31.6%   |
|                        | ≥10                             | 37        | 8.9%    |

**Table 2.** Health-related characteristics among teachers working at southern public universities in Ethiopia, 2021 (N = 418).

| Variables                        | Category    | Frequency | Percent |
|----------------------------------|-------------|-----------|---------|
| Perceived health status          | Healthy     | 361       | 86.4%   |
|                                  | Not healthy | 57        | 13.6%   |
| Chronic diseases (DM, HTN . . .) | Yes         | 376       | 90%     |
|                                  | No          | 42        | 10%     |
| Smoking                          | Yes         | 387       | 92.6%   |
|                                  | No          | 31        | 7.4%    |
| Overweight                       | Yes         | 334       | 79.9%   |
|                                  | No          | 84        | 20.1%   |
| Tested for COVID-19              | Yes         | 372       | 89%     |
|                                  | No          | 46        | 11%     |
| If yes, the test result          | Positive    | 47        | 12.6%   |
|                                  | Negative    | 325       | 87.4%   |

**Table 3.** Knowledge about the second dose of COVID-19 vaccine among teachers working at southern public universities in Ethiopia, 2021 (N = 418).

| Variables  | Category | Frequency | Percent |
|--|----------|-----------|---------|
| Do you know about the second COVID-19 vaccine dose?                      | Yes      | 320       | 76.6%   |
|  | No       | 98        | 23.4%   |
| Do you know about the effectiveness of the second COVID-19 vaccine dose? | Yes      | 216       | 51.7%   |
|  | No       | 202       | 48.3%   |
| Is it very dangerous for health using second vaccine overdoses?          | Yes      | 383       | 91.6%   |
|  | No       | 35        | 8.4%    |
| Does a second vaccine dose increase allergic reactions?                  | Yes      | 172       | 41.1%   |
|  | No       | 246       | 58.9%   |
| Does the second vaccine dose increase autoimmune diseases?               | Yes      | 227       | 54.3%   |
|  | No       | 191       | 45.7%   |

knowledge of participants about the second dose of the COVID-19 vaccine, 254 (60.8%) of them had good knowledge about the vaccine. The mean and the median of summed knowledge scores were 6.85 and 7, respectively. The majority, 320 (76.6%), 216 (51.7%), and 383 (91.6%) of participants knew about the second COVID-19 vaccine dose, the effectiveness of the second COVID-19 vaccine dose, and whether using an overdose of the second COVID-19 vaccine is very dangerous (Table 3).

**Table 4.** Factors associated with knowledge about the second dose of COVID-19 vaccine among teachers working at southern public universities in Ethiopia, 2021 (N = 418).

| Variables                        | Knowledge |      | COR (95% CI)        | AOR (95% CI)               | p-value      |
|----------------------------------|-----------|------|---------------------|----------------------------|--------------|
|                                  | Good      | Poor |                     |                            |              |
| Age 35.57 ± 6.219                |           |      | 1.018 (1.002–3.511) | <b>1.51 (1.003–3.63)</b>   | <b>.030*</b> |
| <b>Marital status</b>            |           |      |                     |                            |              |
| Married                          | 216       | 133  | 0.755 (0.448–1.271) | 0.127 (0.213–2.132)        | .412         |
| Unmarried                        | 38        | 31   | 1                   | <b>1</b>                   |              |
| <b>Profession</b>                |           |      |                     |                            |              |
| Health-related                   | 157       | 96   | 1.146 (1.097–2.712) | <b>1.402 (1.107–3.003)</b> | <b>.000</b>  |
| Non-health-related               | 97        | 68   | 1                   | <b>1</b>                   |              |
| <b>Education</b>                 |           |      |                     |                            |              |
| Degree                           | 18        | 7    | 0.496 (0.189–1.303) | 0.602 (0.278–1.489)        | .389         |
| Masters and equivalent specialty | 185       | 117  | 0.806 (0.502–1.296) | 0.901 (0.256–1.654)        | .578         |
| Ph.D. and equivalent specialty   | 51        | 40   | 1                   | 1                          |              |
| <b>Chronic diseases</b>          |           |      |                     |                            |              |
| Yes                              | 227       | 149  | 1.181 (1.007–2.295) | <b>2.142 (1.337–3.092)</b> | <b>.002*</b> |
| No                               | 27        | 15   | 1                   | 1                          |              |
| <b>Family size</b>               |           |      |                     |                            |              |
| <4                               | 246       | 159  | 1.034 (0.332–3.217) | 1.192 (0.845–2.087)        | .734         |
| ≥4                               | 8         | 5    | 1                   | 1                          |              |
| Work experience 5.66 ± 2.7       |           |      | 1.068 (0.991–1.146) | <b>1.509 (1.151–2.283)</b> | <b>.000*</b> |

\* Statistically significant at  $p < .05$ 

### Factors associated with knowledge about the second dose of COVID-19 vaccine

All sociodemographic and health-related characteristics were entered into bivariate logistic regression. Candidate variables were entered into the multivariable logistic regression model. Age, profession, chronic diseases, and work experience of participants were found to be significantly associated with knowledge about the second dose of COVID-19 vaccine at a  $p$ -value  $< 0.05$ .

A one-year increase in the age of participants was associated with an increase in the likelihood of knowing about the second dose of the COVID-19 vaccine by 1.510 (AOR = 1.51 (95% CI = 1.003–3.63)). Study participants who had health-related professions were 1.402 times more likely to have good knowledge about the second dose of the COVID-19 vaccine compared with those who were non-health-related professionals (AOR = 1.402 (95% CI = 1.107–3.003)). A one-year increase in the work service of study participants was associated with an increase in the likelihood of knowing about the second dose of the COVID-19 vaccine by 1.509 (AOR = 1.509 (95% CI = 1.151–2.283)). Study participants who had chronic diseases were 2.142 times more likely to have good knowledge about the second dose of the COVID-19 vaccine compared to those who did not have (AOR = 2.142 (95% CI = 1.337–3.092)) (Table 4).

### Attitude toward the second dose of COVID-19 vaccine

The mean and the median of the summed score of attitude were 16.5 and 17, respectively. The overall proportion of participants' positive attitudes toward the second dose of vaccine was 333 (79.7%), whereas 85 (20.3%) had a negative attitude toward the COVID-19 vaccines.

### Factors associated with attitude toward the second dose of COVID-19 vaccine

All sociodemographic and health-related characteristics were entered into bivariate logistic regression. Candidate variables were entered into the multivariable logistic regression model. Sex, marital status, profession, chronic diseases, and work experience of participants were found to be significantly associated with attitude toward the second dose of the COVID-19 vaccine. Study participants who were males were 1.386 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared with females (AOR = 1.386 (95% CI = 1.018–2.763)). Study participants who were married were 4.18 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared to those who were not married (AOR = 4.180 (95% CI = 2.397–6.989)). Study participants who had health-related professions were 1.102 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared with those who were non-health-related professionals (AOR = 1.102 (95% CI = 1.008–3.1123)). A one-year increase in the work service of study participants was associated with an increase in the likelihood of having a positive attitude toward the second dose of the COVID-19 vaccine by 1.211 (AOR = 1.211 (95% CI = 1.029–2.877)). Study participants who had chronic diseases were 6.11 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared to those who did not have (AOR = 6.10 (95% CI = 4.892–10.661)) (Table 5).

### Discussion

Vaccination is not the only, but the best, solution to control infectious diseases. However, individuals and groups who choose to delay or refuse vaccines challenge their success.<sup>25</sup> Vaccine hesitancy is believed to be responsible for decreasing



**Table 5.** Factors associated with attitude toward the second dose of COVID-19 vaccine among teachers working at southern public universities in Ethiopia, 2021 (N = 418).

| Variables                  | Attitude |          | COR (95% CI)        | AOR (95% CI)                | p-value      |
|----------------------------|----------|----------|---------------------|-----------------------------|--------------|
|                            | Positive | Negative |                     |                             |              |
| <b>Sex</b>                 |          |          |                     |                             |              |
| Male                       | 245      | 62       | 0.968 (0.566–1.656) | <b>1.386 (1.018–2.763)</b>  | <b>.040*</b> |
| Female                     | 88       | 23       | 1                   | 1                           |              |
| <b>Marital status</b>      |          |          |                     |                             |              |
| Married                    | 270      | 79       | 3.072 (1.282–5.363) | <b>4.180 (2.397–6.989)</b>  | <b>.000*</b> |
| Unmarried                  | 63       | 6        | 1                   | 1                           |              |
| <b>Profession</b>          |          |          |                     |                             |              |
| Health-related             | 202      | 51       | 0.973 (0.598–1.582) | <b>1.102 (1.008–3.123)</b>  | <b>.006*</b> |
| Non-health-related         | 131      | 34       | 1                   | 1                           |              |
| <b>Chronic disease</b>     |          |          |                     |                             |              |
| Yes                        | 311      | 65       | 4.350 (2.244–8.432) | <b>6.110 (4.892–10.661)</b> | <b>.000*</b> |
| No                         | 22       | 20       | 1                   | 1                           |              |
| Tested for COVID-19        |          |          |                     |                             |              |
| Yes                        | 302      | 70       | 0.479 (0.245–0.935) | 0.609(0.298–1.876)          | .430         |
| No                         | 31       | 15       | 1                   | 1                           |              |
| Work experience 5.66 ± 2.7 |          |          | 0.911 (0.828–1.001) | <b>1.211 (1.029–2.877)</b>  | <b>.033*</b> |
| Income                     |          |          |                     |                             |              |
| 5000–10000                 | 249      | 74       | 2.269 (0.998–3.479) | 2.632 (0.888–3.894)         | .662         |
| ≥10000                     | 84       | 11       | 1                   | 1                           |              |

\* Statistically significant at  $p < .05$ 

vaccine coverage and an increased risk of vaccine-preventable disease outbreaks and epidemics.<sup>26</sup> Presently, COVID-19 is a pandemic disease and has become a major global health concern. Consequently, understanding the “high-risk of exposure groups,” especially those with teachers’ knowledge, attitude, and knowledge of the second dose of the COVID-19 vaccine, and the factors associated with it, is necessary to prevent and control the pandemic disease of COVID-19. In this case, public university teachers in southern universities were studied purposely.

In this study, 254 (60.8%) of the participants had good knowledge of the second dose of vaccine. The finding of this study was lower than a study done in the Gurage Zone of Ethiopia (74%), Illibabur and Bedele zones of Ethiopia (64%), Bangladesh (62.1%), Romania (95.15%), Greece (88.28%), and Oman (88.4%).<sup>13,24,27–30</sup> However, it was higher than a study done in West India (35.5%).<sup>15</sup> The disparity may be due to differences in the study population, study design, vaccine schedule, or socio-demographic features of the participants in the study.

In this study, age, profession, chronic diseases, and work experience were found to be significantly associated with knowledge about the second dose of the COVID-19 vaccine.

A one-year increase in the age of participants was associated with an increase in the likelihood of knowing about the second dose of the COVID-19 vaccine by 1.510. The finding was consistent with that of a study done in the Illibabur and Bedele Zones of Ethiopia, west India, and Bangladesh.<sup>15,24,30</sup> This may be because older people develop severe complications more often than younger people; they become worried and search for more information about the vaccine. Study participants who had health-related professions were 1.402 times more likely to have good knowledge of the second dose of the COVID-19 vaccine compared with those who were non-health-related professionals. The finding was similar to a study done in the Illibabur and Bedele zones of Ethiopia and Greece.<sup>24,27</sup> A one-year increase in the work service of study participants was associated with an increase in the likelihood of knowing

about the second dose of the COVID-19 vaccine by 1.509. This may be because as the service year increases, they become exposed to a different source of information and become more aware of the vaccine. Study participants who had chronic diseases were 2.142 times more likely to have had good knowledge about the second dose of the COVID-19 vaccine compared to those who did not have it. This may be due to most of the fatal cases and severe illnesses like acute respiratory distress syndrome (ARDS) occurring in older adults and other people who have underlying medical comorbidities like diabetes, cancer, hypertension, heart, lung, and kidney diseases. Individuals with hypertension, diabetes, and cardiovascular and respiratory system diseases were the most vulnerable groups.<sup>31</sup>

The overall proportion of positive attitudes of participants toward the vaccine was 79.7%. The finding of this study was higher than studies done in the Gurage Zone of Ethiopia, at the national level, Egypt, Belgium, and Romania.<sup>13,18,28,32,33</sup> The discrepancy between these findings might be explained by the difference in the study population, vaccine schedule, study design, and socio-demographic characteristics of the study participants’ service availability. However, the finding of this study was higher than that of a study done in the Illibabur and Bedele zones of Ethiopia.<sup>24</sup> The difference may be due to differences in the study population or time of the study.

Sex, marital status, profession, chronic diseases, and work experience of participants were found to be significantly associated with attitude toward the second dose of the COVID-19 vaccine at  $p < 0.05$ .

Study participants who were males were 1.386 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared with females. The finding of this study was consistent with that of the study in the Illibabur and Bedele zones of Ethiopia<sup>24</sup> but inconsistent with a study done in West India and Bangladesh.<sup>15,30</sup> The possible variation may be due to differences in study time, study population, and vaccination schedule. Study participants who were married were 4.18 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared to those

who did not marry. The finding was consistent with a study done in the Illibabur and Bedele zones of Ethiopia and China. Study participants who had health-related professions were 1.102 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared with those who were non-health-related professionals. This finding was consistent with a study done in the Illibabur and Bedele zones of Ethiopia.<sup>24</sup> A one-year increase in the work service of study participants was associated with an increase in the likelihood of having a positive attitude toward the second dose of the COVID-19 vaccine by 1.211. The finding was similar to a study done in the Illibabur and Bedele zones of Ethiopia<sup>24</sup> but inconsistent with that of Greece.<sup>27</sup> The disparity could be attributed to differences in the study population, study design, vaccine schedule, and socio-demographic characteristics of the study participants.

Study participants who had chronic diseases were 6.11 times more likely to have a positive attitude toward the second dose of the COVID-19 vaccine compared to those who did not have it. This finding was similar to a study done in the Illibabur and Bedele zones of Ethiopia and Italy.<sup>13,24</sup> This is because most of the fatal cases and severe illnesses like acute respiratory distress syndrome (ARDS) occur in older adults and other people who have underlying medical comorbidities like diabetes, cancer, hypertension, heart, lung, and kidney diseases. Individuals with hypertension, diabetes, and cardiovascular and respiratory system diseases were the most vulnerable groups.<sup>31</sup> This is because people become worried and intend to take a vaccine.

This study had limitations. Firstly, since the study is cross-sectional it may not demonstrate direct cause and effect between dependent and independent variables. Secondly, since the data were collected by self-administered questionnaire, there may be response bias.

## Conclusion and Recommendations

Knowledge and attitudes toward the second round COVID-19 vaccine among instructors were low. Age, Profession, work experience, chronic diseases were found to be significantly associated with knowledge about the second round COVID-19 vaccine.

Sex, marital status, profession, work experience, and chronic were found to be significantly associated with attitude toward second round COVID-19 vaccine. Thus, health education and communication are very crucial.

## Ethical approval and consent to the participant

Ethical approval was obtained from the Institutional Review Board (IRB) of Wolaita Sodo University. A permission letter was obtained from the respective universities. The consent form was attached with the questionnaire the participants were requested to read the form before filling the questionnaire. Participants were informed as they can skip question/s that they do not want to answer partially or fully and to stop at any time if they want to do so. Confidentiality of the individual information was assured by not recording the identifying information.

## Acknowledgments

I want to thank my colleges for giving suggestions. I am very grateful to the Wolaita Sodo University College of Health Science and Medicine for giving me the ethical clearance. We are also indebted to thank the respective universities and study participants for their cooperation during data collection.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## Funding

The author(s) reported there is no funding associated with the work featured in this article.

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## Data availability statement

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

## Abbreviations

|          |                                     |
|----------|-------------------------------------|
| ARDS     | Acute Respiratory Distress Syndrome |
| AOR      | Adjusted Odds Ratio                 |
| CI       | Confidence Interval                 |
| COVID-19 | Corona Virus Disease –19            |
| ETB      | Ethiopian Birr                      |
| RNA      | Ribo Nucleic Acid                   |
| SD       | Standard Deviation.                 |

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