frontiers | Frontiers in Education

ORIGINAL RESEARCH
published: 05 April 2022
doi: 10.3389/feduc.2022.799301

Willingness to Receive COVID-19 Vaccine and Associated Factors Among College Students in Gondar City, Northwest Ethiopia

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Specialty section:
This article was submitted to Higher Education, a section of the journal Frontiers in Education

Received: *21 October 2021*
Accepted: *22 February 2022*
Published: *05 April 2022*

Citation:
Aklil MB, Temesgan WZ, Gessesse DN, Kassa BG, Tiguh AE, Kebede AA, Ayalew MD and Yismaw AE (2022) Willingness to Receive COVID-19 Vaccine and Associated Factors Among College Students in Gondar City, Northwest Ethiopia. Front. Educ. 7:799301. doi: 10.3389/feduc.2022.799301

Background: The increasing incidence of coronavirus disease 2019 (COVID-19) continues to cause morbidities, mortalities, and economic crises worldwide. College students are among the high-risk groups to acquire the disease for many reasons. Thus, the COVID-19 vaccine is the most effective and safe method to control this deadly disease. Although World Health Organization advocates vaccination is the best approach to tackle COVID-19, refusal of vaccination is a global problem. Evidence of reaching out to college students is scarce in Ethiopia, particularly in the study area. Therefore, this study aimed to assess willingness to receive the COVID-19 vaccine and associated factors among college students in northwest Ethiopia.

Methods: An institution-based cross-sectional study was conducted among 626 participants from January 12–26, 2021. Data were collected using a pretested, self-administered questionnaire, and a multistage sampling technique was used. Data were entered into Epi Info version 7.1.5.2 and exported into SPSS version 20 for analysis. Both bivariable and multivariable logistic regression analyses were used to identify associated factors. The level of significance was determined based on a p-value < 0.05.

Results: In this study, the student's willingness to receive COVID-19 vaccine was 34.2% [95% confidence interval (CI): 30.9–38.1]. Being third-year student [adjusted odds ratio (AOR) = 1.88; 95% CI: 1.27–2.77], being male (AOR = 1.45; 95% CI: 1.02–2.09), being married (AOR = 2.07; 95% CI: 1.28–3.33), ever watching TV (AOR = 0.39; 95% CI: 0.24–0.65), and having a positive attitude toward COVID-19 prevention (AOR = 2.33; 95% CI: 1.61–3.39) were the factors significantly associated with the willingness to receive the COVID-19 vaccine.

Conclusion: Willingness to receive the COVID-19 vaccine among college students was low. Sensitization of students about COVID-19 vaccine safety and effectiveness before directly giving the vaccine is recommended. Moreover, concerned bodies should provide improved health education to students to bring a favorable attitude toward the COVID-19 vaccine.

Keywords: COVID-19 vaccine, students, Ethiopia, college students, Gondar, willingness

INTRODUCTION

Coronavirus disease 2019 (COVID-19) pandemic has exploded since cases were first identified in Wuhan City, China (Awadasseid et al., 2020). Currently, more than 141 million cases of COVID-19 and more than 3 million deaths have been reported globally. Individuals of all ages are at risk for infection and severe disease [Rivera-Figueroa et al., 2020; World Health Organization [WHO], 2021a]. After the World Health Organization (WHO) declared COVID-19 as a pandemic, governments have globally imposed several preventive measures and protocols to decrease the spread of COVID-19. Preventive measures include the following: using face masks properly and consistently, keeping a 2-meter distance between individuals, handwashing with soap, avoiding touching eyes and nose with an unclean hand, and avoiding overcrowded areas (Baye, 2020). Among other preventive measures, vaccination is one of the most powerful public health preventive interventions that have the greatest impact on the reduction of the burden from infectious diseases and their related mortality (Remy et al., 2014).

The vaccine for COVID-19 has been running multiple trials, and the first vaccine was authorized on December 21, 2020, by European Union (European Medicines Agency, 2020). Then with a further trial, the currently used vaccine, AstraZeneca, was approved on January 29, 2021 (Rzymski et al., 2021). This vaccine is also adopted by the Ethiopian government and distributed all over the country (| WHO | Regional Office for Africa, 2021c). Accordingly, Ethiopia received 2.184 million doses of the COVID-19 vaccine on March 7, 2021. After that, the Ethiopian Ministry of Health (MOH) officially launched the COVID-19 vaccination on March 13, 2021 [World Health Organization [WHO], 2021b].

However, due to the inadequate supply of COVID-19 vaccines, governments have prioritized high-risk groups to receive the initial supply of vaccines. These high-risk groups include health care workers, older persons, and people with chronic comorbid conditions and respiratory problems (Soares et al., 2021).

Even though safe and efficient vaccines against COVID-19 are vital for ending the pandemic, vaccine hesitancy is increasing worldwide (Lazarus et al., 2021). According to a strategic advisory group of experts on immunization, vaccine hesitancy is a delay in acceptance or refusal of vaccination despite the availability of vaccination for a specific pandemic disease (MacDonald and SAGE Working Group on Vaccine Hesitancy, 2015). In many countries, vaccination refusal and misinformation have created major obstacles to achieve optimal vaccine coverage and community immunity (Dubé and MacDonald, 2020). In addition, vaccine apprehension, particularly concerning the COVID-19 vaccine, leads to a false perception that the vaccine has not been thoroughly tested for safety and efficacy (Beck, 2020).

Currently, different studies have emerged examining college students' attitudes toward and intent to receive the COVID-19 vaccine. Studies conducted in China among college students and the population showed that students who had a family member who had received a COVID-19 vaccine and a seasonal flu vaccine had more positive attitudes toward COVID-19 vaccination (Lin et al., 2020; Kecojevic et al., 2021; Rzymski et al., 2021). Another study conducted in Italy among university students revealed that 77.52% of students were willing to get the flu vaccine and 94.73% were willing to be vaccinated against COVID-19 when available (Barello et al., 2020). A study in United States of America showed that the accessibility of media channels increased willingness of people to take the vaccine (Piltch-Loeb et al., 2021). In addition, being a medical student, having undertaken a previous vaccination against flu, and having a high level of concern and perceived vulnerability to the COVID-19 pandemic, sex, residence, education, and occupation were predictive factors for taking COVID-19 vaccination (Danabal and Magesh, 2021; El-Elimat et al., 2021; Pastorino et al., 2021).

Scholars revealed that the effect of COVID-19 on the specific high-risk groups and the general population is somewhat different, which might cause a dissimilar response to COVID-19 vaccination (Borowiak et al., 2021). College students who resumed their education during the pandemic are among the subpopulation at a high risk of COVID-19 disease. The crowded setting of classes and frequent movement of students between the community and colleges inflate the widespread COVID-19 infection (Walke et al., 2020). In Ethiopia, studies addressing the highly vulnerable college students are scarce, particularly in the study area. Therefore, understanding college students' willingness to receive a COVID-19 vaccine and identifying influencing factors may help in the development and implementation of the different strategies, thereby increasing the uptake of the COVID-19 vaccine and curbing COVID-19 infection. Moreover, it is reasonable to include these age groups since they are reluctant to accept others' ideas and follow their viewpoints only. Thus, this study assessed the willingness of the COVID-19 vaccine and associated factors among college students in Gondar city, northwest Ethiopia. Based on our objectives, we hypothesized the following points: To what extent are students willing to receive the COVID-19 vaccine? and Do sociodemographic factors affect the willingness of students to receive the COVID-19 vaccine?

Abbreviations: AOR, adjusted odds ratio; CI, confidence interval; COR, crude odds ratio; COVID-19, coronavirus disease 2019; MOH, Ministry of Health; OR, odds ratio; SARS-CoV, severe acute respiratory syndrome corona Virus; SPSS, Statistical Package of Social Science; TV, television; TVET, Technical and Vocational Education and Training; WHO, World Health Organization.

MATERIALS AND METHODS

Study Setting and Design

An institution-based cross-sectional study was conducted from January 12–26, 2021, in Gondar city public colleges. Gondar city is located 166 km away from Bahir Dar, the capital city of Amhara regional state, and 750 km away from Addis Ababa, the capital of Ethiopia. According to the population projections of Ethiopia for all regions at the Woreda level from 2014 to 2017, the total population of the city was estimated to be 306,246. Among these, 156,276 are women (Abebe, 2013). Currently, it has 4 public colleges, which are Teachers Training College, two Technical and Vocational Education and Training (TVET) colleges, and Teda Health Science College. According to each college official's report,

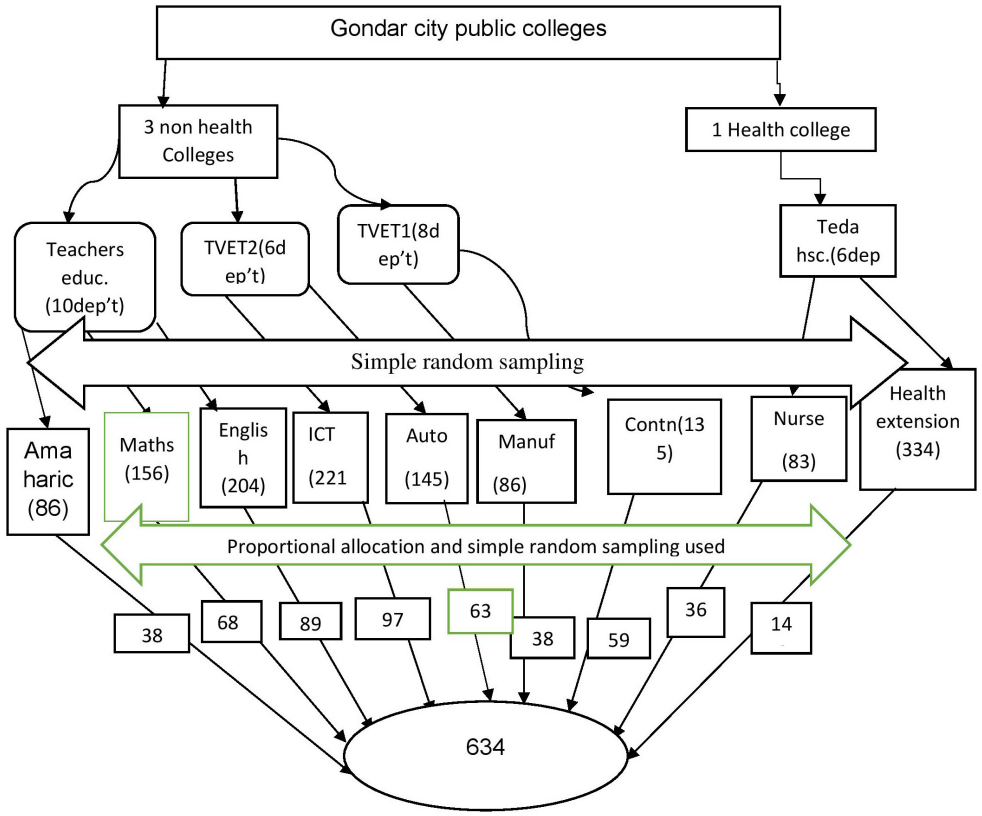

FIGURE 1 | Schematic presentation of the sampling procedure to assess COVID-19 vaccine and associated factors among college students in Gondar city, northwest Ethiopia, 2021.

more than 12,000 students are attending their education in a face-to-face way.

Source Population

All regular public college students attend their education in Gondar city.

Study Population

The study population consisted of all students in the selected departments who were available during the data collection period.

Sample Size Determination and Sampling Technique

The sample size was determined using a single population proportion formula with the following assumptions: the proportion of willingness to take the COVID-19 vaccine 50% (since there was no similar study), 95% confidence level (CI), and 5% margin of error.

Thus, $n = \frac{(Z\alpha/2)^2 p(1-p)}{d^2} = n = \frac{(1.96)^{2*}0.5\ (1-0.5)}{(0.05)2} = 384$, where n = required sample size, α = level of significant, z = standard normal distribution curve value for 95% CI = 1.96, p = willingness to receive the COVID-19 vaccine among college students, and d = margin of error. After considering a design effect of 1.5 and a 10% non-response rate, the final sample size was 634.

A multistage sampling technique was employed to reach out to the study participants. First, we classified Gondar city colleges as health and non-health colleges because the reference population is different. Then, 9 departments were randomly selected by lottery method from among the 30 total departments. The list of the students was obtained from each department, and the sampling frame was prepared. After proportional size allocation was done for each department, the study participants were selected using a simple random sampling technique (**Figure 1**).

Data Collection Instrument and Procedures

A self-administered, semi-structured, and pretested questionnaire was used to collect data. The questionnaire was prepared after reviewing different published articles (Akalu et al., 2020; Asemahagn, 2020; Maheshwari et al., 2020; Berihun et al., 2021) and WHO guidelines (Ortiz-Prado et al., 2020), which was first in English and translated to the local language (Amharic) with the assistance of language experts to make it simple and understandable. The questionnaire contains the sociodemographic characteristics of respondents, knowledge, attitude, and practice of COVID-19 preventive measures and willingness to receive the COVID-19 vaccine. A total of four male

TABLE 1 | Sociodemographic characteristics of study participants in Gondar city, Northwest Ethiopia, 2021 (n = 626).

Variables and categories	Frequency	Percent (%)
Age of students (n = 626)		
18–24	472	75.4
≥25	154	24.6
Year of study		
Second year	257	41.0
Third year	333	53.2
Fourth	36	5.8
Department		
Health	182	29.1
Non-health	444	70.9
Sex		
Male	276	44.1
Female	350	55.9
Residence		
Urban	469	74.9
Rural	157	25.1
Live with		
Alone	196	31.3
With friends	85	13.6
With family	345	55.1
Number of family		
< 5	347	55.4
≥5	279	44.6
Marital status of students		
Married	126	20.1
Unmarried	500	79.9
Have chronic disease		
Yes	33	5.3
No	593	94.7
Educational status of mother		
Unable to read and write	269	43
Able to read and write	210	335
Primary	68	10.9
Secondary	26	4.2
College and above	53	8.5
Educational status of father		
Unable to read and write	180	28.8
Able to read and write	251	40.1
Primary	84	13.4
Secondary	42	6.7
College and above	69	11
Have you ever victim by COVID-19		
Yes	16	2.6
No	610	97.4
Member of family victimized by COVID-19		
Yes	20	3.2
No	606	96.8
Screened for COVID-19 disease		
Yes	200	31.9
No	426	68.1
Have you watch television?		
Yes	484	77.3
No	142	22.7
Frequency watching television (n = 484)		
Daily	80	16.6
Once per week	83	17.1
Twice per week	141	29.1
Three times per week	180	37.2
Have you listen radio?		
Yes	537	85.8
No	89	14.2
Frequency of listing radio (n = 537)		
Daily	67	12.5
Once per week	110	20.5
Twice per week	159	29.6
Three times per week	201	37.4
Have you use smart phone?		
Yes	334	53.4
No	292	46.6

BSc midwives data collectors and one MSc midwife supervisor have participated in the data collection process. During the data collection, important COVID-19 preventive precautions were undertaken.

Data Quality Control

The questionnaire was pretested on 5% of the calculated sample size to assess the validity of the tool. One-day training was given for all data collectors and supervisors regarding the aim of the study, the contents of the tool, and methods for data collection. To ensure confidentiality and prevent information contamination, questionnaires were distributed and collected on the same day. The collected data were checked for completeness before data entry by the supervisor and the research team.

Data Processing and Analysis

Data were entered into Epi Info version 7.1.5.2 and exported to SPSS version 20 for analysis. Bivariable and multivariable logistic regression analyses were used to determine factors associated with willingness to receive the COVID-19 vaccine. Variables with a p-value of < 0.25 in the bivariable analysis were included in the multivariable logistic regression to adjust for possible confounders. A p-value of < 0.05 with a 95% CI for the adjusted odds ratio (AOR) was used to determine the level of significance. The descriptive parts of the result are presented by texts, tables, and figures.

Ethics Approval and Consent to Participate

The study was conducted under the Ethiopian Health Research Ethics Guideline and the declaration of Helsinki. Ethical clearance was obtained from the Institutional Ethical Review Board of the University of Gondar (approval number: V/P/RCS/05/767/2021). A letter of cooperation was obtained from the Gondar city education office and each college

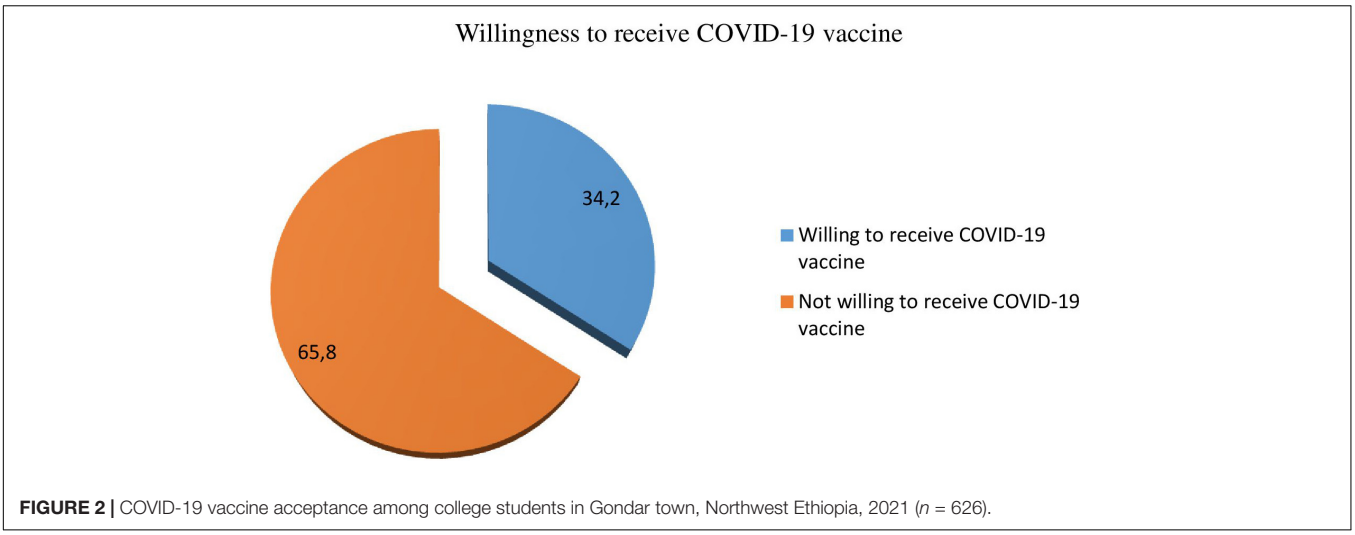

FIGURE 2 | COVID-19 vaccine acceptance among college students in Gondar town, Northwest Ethiopia, 2021 (*n* = 626).

administrative office. Then, written informed consent was obtained from each study participant after the purpose of the study was explained. Any student who was not willing to participate in the study was not forced, no personal identifications were included in the datasheet, and all data taken from the participants were kept strictly confidential and used only for the study purpose.

Operational Definition and Measurement

The outcome variable willingness to receive the COVID-19 vaccine was assessed by asking "will you get vaccinated without a dilemma, if you get the COVID-19 vaccine?" If the respondents answered "yes," it is considered as willing to receive the COVID-19 vaccine and labeled as "1" for analysis, while if the respondents answered "no," it is considered as not willing to take the COVID-19 vaccine and labeled as "0."

Good knowledge: Those respondents who scored above the mean of knowledge questions were taken as having good knowledge toward COVID-19 prevention (Kassie et al., 2020).

Positive attitude: Those respondents who scored above the mean of attitude questions were taken as having a positive attitude to the prevention of COVID-19 (Kassie et al., 2020).

Good practice: Those respondents who scored above the mean of practice questions were taken as having good preventive practice to COVID-19 (Alrubaiee et al., 2020).

RESULTS

Sociodemographic Characteristics of the Study Participants

In this study, a total of 626 study participants were included in the analysis, making a response rate of 98.7%. The mean age of study participants was 23.01 (SD ± 4.155) years, and three-quarters of them were classified under the age group of 18–24. The majority (79.9%) of the respondents were unmarried and more than half (53.2%) of them were second-year students. About 70.9% of participants were from non-health colleges. More than three-quarters (77.3%) of the study participants have watched television (**Table 1**).

Students' Knowledge, Attitude, and Practice Toward COVID-19 Preventive Measures

Out of the total study participants, 433 (69.2%) had good knowledge, 319 (51%) had a positive attitude, and 426 (68.1%) had good practice to COVID-19 preventive measures.

Willingness to Receive the COVID-19 Vaccine Among College Students

Willingness to receive the COVID-19 vaccine was found to be 34.2% (95% CI: 30.9–38.1) (**Figure 2**). The most common reasons for refusal of accepting the COVID-19 vaccine were fear of side effects on daily activity (59.4%), perceiving the vaccine may not be effective to COVID-19 prevention (69.6%), and the vaccine may not be safe (74%) (**Table 2**).

Factors Associated With Willingness to Receive the COVID-19 Vaccine

The bivariable analysis revealed that year of study, sex of the study participants, living with family, marital status, maternal education, paternal education, watching TV, listening to the radio, attitude, and knowledge were significantly associated with willingness to receive the COVID-19 vaccine. However, year of study, sex, marital status, watching TV, and attitude were the factors associated with the outcome variable in the multivariable logistic regression. Accordingly, being third-year students were 1.88 (AOR = 1.88, 95% CI: 1.27–2.77) times more likely to accept the COVID-19 vaccine as compared with being second-year students. Similarly, the odds of willingness to receive the COVID-19 vaccine were 1.45 times higher among male students (AOR = 1.45, 95% CI: 1.02–2.09) compared with female study participants. In addition, the odds of willingness to receive the COVID-19 vaccine were 2.07 times higher among married participants (AOR = 2.07, 95% CI: 1.28–3.33) compared with

unmarried participants. Participants who have ever watched TV were 61% (AOR = 0.39, 95% CI: 1.28–3.33) less likely to be willing to receive the COVID-19 vaccine as compared with their counterparts. Moreover, participants who had a positive attitude toward COVID-19 prevention were 2.33 (AOR = 2.33, 95% CI: 1.61–3.39) times more likely to be willing to receive the COVID-19 vaccine as compared with those participants who had a negative attitude toward COVID-19 prevention (**Table 3**).

DISCUSSION

The best modalities for tackling the surge of COVID-19 pandemic disease are applying the standard precautions of COVID-19 prevention and getting the COVID-19 vaccine. But, COVID-19 vaccination refusal is a great issue globally, particularly in sub-Saharan Africa (Sallam, 2021). Therefore, this institutional-based cross-sectional study aimed to assess willingness to receive the COVID-19 vaccine and associated factors among college students in Gondar city, Northwest Ethiopia, 2021. This study result showed that willingness to receive the COVID-19 vaccine was 34.2%.

This finding is in line with studies done in Ethiopia (31.4%) (Belsti et al., 2021), Jordan (37.4%) (El-Elimat et al., 2021), and the United States (36%) (Shekhar et al., 2021). However, it is lower than studies conducted in China (91.3%) (Wang et al., 2020), New York (86.1%) (Ciardi et al., 2021), Uganda (53.6%) (Echoru et al., 2021), and Ghana (39.3%) (Kabamba Nzaji et al., 2020). Also, this finding is lower than studies done in some parts of Ethiopia, such as the Gurage zone (70.7%) (Mose and Yeshaneh, 2021) and Sodo town (45.5%) (Mesele, 2021). This variation might be due to the differences in sociodemographic, sociocultural, socioeconomic, and source populations. For instance, the study in China was conducted in all adult Chinese populations. In addition, 55.4% of these adults had a bachelor's degree and 67.3% of them were married. However, the study participants in this study were students and only 20.1% of them were married. Empirical evidence supports that a higher level of education increases the odds of willingness to get the COVID-19 vaccine (Abdulah, 2021; Handebo et al., 2021).

In contrast, willingness to receive the COVID-19 vaccine was higher than a study done in Congo, in which 27.7% of the study participants were willing to take the vaccine (Kabamba Nzaji et al., 2020). This inconsistency might be due to differences in the time gap and the study population. In our study, the COVID-19 vaccine willingness was assessed after the information was distributed through different media, and the attitude and knowledge level of the population changed as compared with the initial time of the COVID-19 vaccine began to be delivered. During the initial phase of the COVID-19 vaccine campaign, there were misinformation and rumors shared with the population about the vaccine's safety, side effects, and efficacy, which will lead to hesitancy to get the vaccine. In addition, the study population from the Congo study was health care providers, so everyone can expect that health care providers may have a better way of understanding the vaccine effectiveness and possible side effects as compared with college students (Wang et al., 2021).

In our hypothesis, we confirm that some sociodemographic factors like being men, being a third-year student, and being married were factors affecting the willingness of the COVID-19 vaccine. The odds of having the willingness to receive the COVID-19 vaccine among male students were 1.45 times higher as compared with their counterparts. This study is supported by studies done in Ethiopia (Mesele, 2021), China (Wang et al., 2020), Jordan (El-Elimat et al., 2021), and Uganda (Echoru et al., 2021). The possible reason might be men are more exposed to different media and gather information related to the COVID-19 vaccine compared with women. These might provide comprehensive information and build a positive attitude and knowledge toward COVID-19 vaccine acceptance. Another reason might be that there is a sex difference in COVID-19 case mortality (Green et al., 2021) and immunity differences among men and women (Biswas, 2020).

This study revealed that the year of study of the students was positively associated with willingness to receive the COVID-19 vaccine. Accordingly, those third-year students were 1.88 times more likely to be willing to receive the COVID-19 vaccine as compared with second-year students. This might be due to the fact that willingness to get the COVID-19 vaccine is influenced by educational level. Evidence supports that a higher educational level increases individuals' willingness to receive the COVID-19 vaccine (Abdulah, 2021). This is because people with a higher level of education might have a better possibility of grasping and applying knowledge, thus, they will respond to and accept the COVID-19 vaccine.

The marital status of respondents was also a predictor of willingness to receive the COVID-19 vaccine. Thus, married participants were 2.07 times more likely to be willing to receive the COVID-19 vaccine compared with their counterparts. This finding is supported by a study done in China (Wang et al., 2020). However, it is not consistent with the finding of the study done in Ethiopia (Belsti et al., 2021). This may be due to the fact that most married participants could share additional information with their husbands. Besides, married people may feel responsible and may take care of the family. This increases the awareness and changes the attitude of participants toward the importance of the COVID-19 vaccine. Moreover, the lack of shared information, motivation, decision, and responsibility from the husband in

TABLE 2 | Reasons for refusal of accepting the COVID-19 vaccine among college students in Gondar city, Northwest Ethiopia, 2021 (n = 412).

Reasons for COVID-19 vaccine refusal	Frequency	Percent (%)
Fear of side effects on daily activity	372	59.4
Not effective for COVID-19 prevention	436	69.6
The vaccine may not be safe	463	74
Due to lake of detail information about vaccine	395	63.1
Not trust the benefit of COVID-19 vaccine	251	40
Fear of undiagnosed future side effects	376	60.1
Prefer natural immunity than COVID-19 vaccine	328	52.4
The vaccine may induce COVID-19 virus	151	41.6
I'm not risky group for COVID-19 virus	296	47.3

TABLE 3 | Bivariable and multivariable analysis of factors associated with willingness to receive the COVID-19 vaccine among college students in Gondar city, Northwest Ethiopia, 2021 (n = 626).

Variable	Willingness to receive COVID-19 vaccine		COR (95%)	AOR (95%)
	Yes	No		
Year of study				
Second year	69	188	1	1
Third year	134	199	1.83 (1.29,2.60)	**1.88 (1.27–2.77)***
Fourth year	11	25	1.19 (0.56,2.56)	0.74 (0.32–1.78)
Sex				
Male	107	169	1.44 (1.03–2.00)	**1.45 (1.02–2.09)***
Female	107	243	1	1
Live with				
Alone	73	123	1	1
With friends	39	46	1.43 (0.85–2.39)	1.62 (0.92–2.86)
With family	102	243	0.70 (0.48–1.02)	0.90 (0.59–1.36)
Marital status				
Married	56	70	1.73 (1.16–2.58)	**2.07 (1.28–3.33)***
Unmarried	158	342	1	1
Maternal education level				
Unable to read and write	96	173	1	1
Able to read and write	79	131	1.08 (0.74–1.58)	1.39 (0.86–2.25)
Primary education	24	44	0.98 (0.56–1.71)	0.85 (0.40–1.78)
Secondary education	4	22	0.33 (0.11–0.98)	0.73 (0.20–2.64)
College and above	11	42	0.47 (0.23–0.96)	0.80 (0.33–1.97)
Paternal education				
Unable to read and write	66	114	1	1
Able to read and write	87	164	0.92 (0.62–1.36)	0.88 (0.57–1.37)
Primary education	42	42	1.73 (1.02–0.79)	1.91 (1.08–3.38)
Secondary education	6	36	0.29 (0.12–0.72)	0.28 (0.10–0.72)
College and above	13	56	0.40 (0.20–0.79)	0.43 (0.21–0.88)
Watch TV				
Yes			0.72 (0.48–1.05)	**0.39 (0.24–0.65)****
No			1	1
Listen radio				
Yes	192	345	1.69 (1.02–2.83)	1.82 (0.97–3.40)
No	22	67	1	1
Attitude				
Positive attitude	138	181	2.32 (1.65–3.26)	**2.33 (1.61–3.39)****
Negative attitude	76	231	1	1
Knowledge status				
Poor	52	141	1	1
Good	162	271	1.62 (1.12–2.35)	1.11 (0.70–1.76)

*COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval; 1, reference category; *p < 0.05, **p < 0.001. Bold values to show significantly associated variables.*

unmarried participants may affect willingness to get the COVID-19 vaccine.

Students who had a positive attitude toward COVID-19 prevention were 2.33 times more likely to be willing to receive the COVID-19 vaccine as compared with those students who had a negative attitude. This finding was consistent with studies done in Congo (Kabamba Nzaji et al., 2020), Jersey (Kecojevic et al., 2021), and China (Zhang et al., 2021). This might be due to the fact that participants who were optimistic and convinced that the disease would eventually be successfully controlled were more inclined to accept the COVID-19 vaccine as compared with those participants who had a poor attitude toward the disease, its transmission, and controlling movements were less likely to be willing to receive the COVID-19 vaccine.

This study also demonstrates that watching TV was a significant predictor of willingness to receive the COVID-19 vaccine. Accordingly, students who have ever watched TV were 61% less likely to be willing to receive the COVID-19 vaccine as compared with their counterparts (AOR: 0.39, 95% CI: 0.24–0.65). This finding contradicts a study done in Wolayita Sodo town (Mesele, 2021). It is expected that people who were exposed to different mass media have a better understanding and positive attitude toward the COVID-19 vaccine (Piltch-Loeb et al., 2021). Despite their huge contribution in maintaining

a positive attitude toward COVID-19 prevention, some carless and private media centers may disseminate negative information. In this case, a single negative and uncertain information has the potential to disrupt the long-term collected trust of the participants.

These findings imply that, despite advocation being done by WHO and MOH of Ethiopia on the benefit of the COVID-19 vaccine, statistics are still indicative of low willingness to receive the COVID-19 vaccine. The authors strongly believe in the need for further health education and reiteration of the benefits of vaccines by different teaching methods.

Strength and Limitation of the Study

We used a self-administered survey by applying the standard precaution of COVID-19 prevention, which gives better data quality than an online survey. The finding shares the drawback of a cross-sectional study design. A longitudinal study may have paramount importance for such reports. Moreover, these sampled students are not representative of the whole population.

CONCLUSION

Nearly one-third of students had a willingness to receive the COVID-19 vaccine, which is low compared with previous studies. Being a third-year student, being men, being married, watching TV, and having a positive attitude toward COVID-19 prevention were factors associated with willingness to receive the COVID-19 vaccine. Thus, concerned bodies should prepare effective strategies that have the potential to increase the students' willingness to receive the COVID-19 vaccine without hesitation. Thus, health education and sensitization of the students about the importance of the COVID-19 vaccine should be provided. In addition, care should be taken to mass media to disseminate factual information in a way that is adherent to the ministry of health and WHO.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Institutional Ethical Review Board (IRB) of the University of Gondar, Ethiopia. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MBA involved in the conception and design of the study, participated in data collection, analyzed the data, drafted the manuscript, and approved the final version of the manuscript. WT, DG, BK, AT, AK, MDA, and AY approved the proposal with some revisions, participated in data analysis, revised subsequent drafts of the manuscript, and approved the last version of the manuscript. All authors have read and approved the manuscript.

ACKNOWLEDGMENTS

We would like to thank the University of Gondar for ethical approval. We would also like to thank to each college administrative official, data collector, supervisor, and study participant.

REFERENCES

Abdulah, D. M. (2021). Prevalence and correlates of COVID-19 vaccine hesitancy in the general public in Iraqi Kurdistan: a cross-sectional study. *J. Med. Virol.* 93, 6722–6731. doi: 10.1002/jmv.27255

Abebe, A. (2013). *Federal Democratic Republic of Ethiopia Central Statistical Agency Population Projection of Ethiopia for All Regions at Wereda Level from 2014 – 2017*. Addis Ababa: Central Statistical Agency of Ethiopia, 64.

Akalu, Y., Ayelign, B., and Molla, M. D. (2020). Knowledge, attitude and practice towards COVID-19 among chronic disease patients at Addis Zemen hospital, Northwest Ethiopia. *Infect. Drug Resist.* 13, 1949–1960. doi: 10.2147/IDR.S258736

Alrubaiee, G. G., Al-Qalah, T. A. H., and Al-Aawar, M. S. A. (2020). Knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19 among health care providers in Yemen: an online cross-sectional survey. *BMC Public Health* 20:1541. doi: 10.1186/S12889-020-09644-Y

Asemahagn, M. A. (2020). Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Trop. Med. Health* 48:72. doi: 10.1186/s41182-020-00254-3

Awadasseid, A., Wu, Y., Tanaka, Y., and Zhang, W. (2020). Initial success in the identification and management of the coronavirus disease 2019 (COVID-19) indicates human-to-human transmission in Wuhan, China. *Int. J. Biol. Sci.* 16, 1846–1860. doi: 10.7150/IJBS.45018

Barello, S., Nania, T., Dellafiore, F., Graffigna, G., and Caruso, R. (2020). " Vaccine hesitancy " among university students in Italy during the COVID-19 pandemic. *Eur. J. Epidemiol.* 35, 781–783. doi: 10.1007/s10654-020-00670-z

Baye, K. (2020). *COVID-19 Prevention Measures in Ethiopia: Current Realities and Prospects*. Washington, DC: International Food Policy Research Institute (IFPRI), 14. doi: 10.2499/P15738COLL2.133729

Beck, M. (2020). Humanity for Asylum Seekers: how migrant protection protocols and the March 20th CDC Order violate the constitutional rights of Asylum Seekers during the COVID-19 pandemic. *Center Health Law Policy Bioethics* 72, 1–63. doi: 10.1163/9789004480575_006

Belsti, Y., Gela, Y. Y., Akalu, Y., Dagnew, B., Getnet, M., Abdu Seid, M., et al. (2021). Willingness of Ethiopian Population to Receive COVID-19 Vaccine. *J Multidiscip Healthc* 14, 1233–1243. doi: 10.2147/JMDH.S312637

Berihun, G., Walle, Z., Teshome, D., Berhanu, L., Abebe, M., Ademas, A., et al. (2021). Knowledge, attitude, and preventive practices towards COVID-19 among students of Ethiopian higher education institutions. *J. Multidiscip. Healthc.* 14, 2123–2136. doi: 10.2147/JMDH.S322495

Biswas, R. (2020). Are men more vulnerable to covid-19 as compared to women. *Biomed. J. Sci. Tech. Res.* 27, 2045–2046. doi: 10.26717/BJSTR.2020.27.004481

Borowiak, M., Ning, F., Pei, J., Zhao, S., Tung, H. R., and Durrett, R. (2021). Controlling the spread of COVID-19 on college campuses. *Math. Biosci. Eng.* 18, 551–563. doi: 10.3934/MBE.2021030

Ciardi, F., Menon, V., Jensen, J. L., Shariff, M. A., Pillai, A., Venugopal, U., et al. (2021). Knowledge, attitudes and perceptions of covid-19 vaccination among healthcare workers of an inner-city hospital in New York. *Vaccines* 9:516. doi: 10.3390/vaccines9050516

Danabal, K. G. M., and Magesh, E. (2021). Attitude towards COVID 19 vaccines and vaccine hesitancy in urban and rural communities in Tamil Nadu, India – a community based survey. *BMC Health Serv. Res.* 21:994. doi: 10.1186/S12913-021-07037-4/FIGURES/1

Dubé, E., and MacDonald, N. E. (2020). How can a global pandemic affect vaccine hesitancy? *Expert Rev. Vaccines* 19, 899–901. doi: 10.1080/14760584.2020.1825944

Echoru, I., Ajambo, P. D., Keirania, E., and Bukenya, E. E. M. (2021). Sociodemographic factors associated with acceptance of COVID-19 vaccine and clinical trials in Uganda : a cross-sectional study in western Uganda. *BMC Public Health* 21:1106. doi: 10.1186/s12889-021-11197-7

El-Elimat, T., AbuAlSamen, M. M., Almomani, B. A., Al-Sawalha, N. A., and Alali, F. Q. (2021). Acceptance and attitudes toward COVID-19 vaccines: a cross-sectional study from Jordan. *PLoS One* 16:e0250555.

European Medicines Agency (2020). *EMA Recommends first COVID-19 Vaccine for Authorisation in the EU*. Amsterdam: European Medicines Agency.

Green, M. S., Nitzan, D., Schwartz, N., Niv, Y., and Peer, V. (2021). Sex differences in the case-fatality rates for COVID-19—A comparison of the age-related differences and consistency over seven countries. *PLoS One* 16:e0250523. doi: 10.1371/JOURNAL.PONE.0250523

Handebo, S., Wolde, M., Shitu, K., and Kassie, A. (2021). Determinant of intention to receive COVID-19 vaccine among school teachers in Gondar City, Northwest Ethiopia. *PLoS One* 16:e0253499. doi: 10.1371/journal.pone.0253499I

Kabamba Nzaji, M., Kabamba Ngombe, L., Ngoie Mwamba, G., Banza Ndala, D. B., Mbidi Miema, J., Luhata Lungoyo, C., et al. (2020). Acceptability of vaccination against COVID-19 among healthcare workers in the democratic republic of the Congo. *Pragmat. Obs. Res.* 11, 103–109. doi: 10.2147/POR.S271096

Kassie, B. A., Adane, A., Tilahun, Y. T., Kassahun, E. A., Ayele, A. S., and Belew, A. K. (2020). Knowledge and attitude towards COVID-19 and associated factors among health care providers in Northwest Ethiopia. *PLoS One* 15:e0238415. doi: 10.1371/journal.pone.0238415

Kecojevic, A., Basch, C. H., Sullivan, M., Chen, Y. T., and Davi, N. K. (2021). COVID-19 vaccination and intention to vaccinate among a sample of college students in New Jersey. *J. Community Health* 46, 1059–1068. doi: 10.1007/S10900-021-00992-3

Lazarus, J. V., Ratzan, S. C., Palayew, A., Gostin, L. O., Larson, H. J., Rabin, K., et al. (2021). A global survey of potential acceptance of a COVID-19 vaccine. *Nat. Med.* 27, 225–2284. doi: 10.1038/s41591-020-1124-9

Lin, C., Tu, P., and Beitsch, L. M. (2020). Confidence and receptivity for COVID-19 vaccines: a rapid systematic review. *Vaccines* 9:16. doi: 10.3390/VACCINES9010016

MacDonald, N. E., and SAGE Working Group on Vaccine Hesitancy (2015). Vaccine hesitancy: definition, scope and determinants. *Vaccine* 33, 4161–4164. doi: 10.1016/J.VACCINE.2015.04.036

Maheshwari, S., Gupta, P. K., Sinha, R., and Rawat, P. (2020). Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: a cross-sectional study. *J. Acute Dis.* 9:100. doi: 10.4103/2221-6189.283886

Mesele, M. (2021). COVID-19 vaccination acceptance and its associated factors in Sodo Town, Wolaita Zone, Southern Ethiopia: cross-sectional study. *Infect. Drug Resist.* 14, 2361–2367. doi: 10.2147/IDR.S320771

Mose, A., and Yeshaneh, A. (2021). COVID-19 vaccine acceptance and its associated factors among pregnant Women attending antenatal care clinic in Southwest Ethiopia: institutional-based cross-sectional study. *Int. J. Gen. Med.* 14, 2385–2395. doi: 10.2147/IJGM.S314346

Ortiz-Prado, E., Simbaña-Rivera, K., Gómez-Barreno, L., Rubio-Neira, M., Guaman, L. P., Kyriakidis, N. C., et al. (2020). Clinical, molecular, and epidemiological characterization of the SARS-CoV-2 virus and the Coronavirus disease 2019 (COVID-19), a comprehensive literature review. *Diagn. Microbiol. Infect. Dis.* 98:115094. doi: 10.1016/j.diagmicrobio.2020.115094

Pastorino, R., Villani, L., Mariani, M., Ricciardi, W., Graffigna, G., and Boccia, S. (2021). Impact of COVID-19 pandemic on Flu and COVID-19 vaccination intentions among university students. *Vaccines* 9:70. doi: 10.3390/VACCINES9020070

Piltch-Loeb, R., Savoia, E., Goldberg, B., Hughes, B., Verhey, T., Kayyem, J., et al. (2021). Examining the effect of information channel on COVID-19 vaccine acceptance. *PLoS One* 16:e0251095. doi: 10.1371/journal.pone.0251095

Remy, V., Largeron, N., Quilici, S., and Carroll, S. (2014). the economic value of vaccination: why prevention is wealth. *Value Health* 17:A450. doi: 10.1016/j.jval.2014.08.1211

Rivera-Figueroa, E. I., Santos, R., Simpson, S., and Garg, P. (2020). Incomplete Kawasaki disease in a child with COVID-19. *Indian Pediatr.* 57, 680–681. doi: 10.1007/S13312-020-1900-0

Rzymski, P., Zeyland, J., Poniedziałek, B., Małecka, I., and Wysocki, J. (2021). The perception and attitudes toward COVID-19 vaccines: a cross-sectional study in Poland. *Vaccines* 9:382. doi: 10.3390/VACCINES9040382

Sallam, M. (2021). COVID-19 vaccine hesitancy worldwide : a concise systematic review of vaccine acceptance rates. *Vaccines* 9:160. doi: 10.3390/vaccines9020160

Shekhar, R., Sheikh, A. B., Upadhyay, S., Singh, M., Kottewar, S., Mir, H., et al. (2021). COVID-19 vaccine acceptance among health care workers in the United States. *Vaccines* 9:119. doi: 10.3390/vaccines9020119

Soares, P., Rocha, J. V., Moniz, M., Gama, A., Laires, P. A., Pedro, A. R., et al. (2021). Factors associated with COVID-19 vaccine hesitancy. *Vaccines* 9:300. doi: 10.3390/VACCINES9030300

Walke, H. T., Honein, M. A., and Redfield, R. R. (2020). Preventing and responding to COVID-19 on college campuses. *JAMA* 324, 1727–1728. doi: 10.1001/JAMA.2020.20027

Wang, J., Feng, Y., Hou, Z., Lu, Y., Chen, H., Ouyang, L., et al. (2021). Willingness to receive SARS-CoV-2 vaccine among healthcare workers in public institutions of Zhejiang Province, China. *Hum. Vaccin. Immunother.* 17, 2926–2933. doi: 10.1080/21645515.2021.1909328

Wang, J., Jing, R., Lai, X., Zhang, H., Lyu, Y., Knoll, M. D., et al. (2020). Acceptance of COVID-19 vaccination during the COVID-19 pandemic in China. *Vaccines (Basel)* 8:482. doi: 10.3390/vaccines8030482

World Health Organization [WHO] (2021a). *Coronavirus disease (COVID-19) Report on October 7,2021*. Available online at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019 (accessed October 7, 2021).

World Health Organization [WHO] (2021b). *World Health Organization: Ethiopia Introduces COVID-19 Vaccine in a National Launching Ceremony*. Geneva: WHO.

| WHO | Regional Office for Africa (2021c). *2.2 Million COVID-19 Vaccines Allocated by the COVAX Facility Arrive in Ethiopia, Marking the Start of the Country's COVID-19 Vaccination Campaign*. Geneva: WHO.

Zhang, K. C., Fang, Y., Cao, H., Chen, H., Hu, T., Chen, Y., et al. (2021). Behavioral intention to receive a COVID-19 vaccination among Chinese factory workers: cross-sectional online survey. *J. Med. Internet Res.* 23:e24673. doi: 10.2196/24673

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The reviewers SF and AS declared a shared affiliation with several of the authors MBA, WT, DG, BK, AT, AK, and AY to the handling editor at the time of the review.

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