Knowledge and Attitude towards COVID-19 Vaccination and Associated Factors among College Students in Northwest Ethiopia,2021

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Abstract

Background: It is imperative to ensure optimal vaccine uptake at the population level to combat the deadly COVID-19 pandemic disease. However, refusal of the COVID-19 vaccine, poor knowledge, and a negative attitude towards vaccination are the challenges of the world. College students are among the high-risk subgroups of the population to COVID-19 infection and the main source of information and trust in vaccines to the society. Also, their judgement on vaccine affect the public attitude towards vaccination. Therefore, this study aimed to assess knowledge and attitude towards COVID-19 vaccination and associated factors among college students in Gondar city, northwest Ethiopia.

Methods: An institution-based cross-sectional study was conducted among 626 study participants in Gondar city. A multistage sampling technique was used to recruit the study participants. A pretested self-administered questionnaire was used to collect the data. Bivariable and multivariable logistic regression analyses were performed to assess factors associated with knowledge and attitude towards COVID-19 vaccination. The level of significance was claimed based on a p-value < 0.05.

Results: In this study, 46.8% (95% CI: 43.3, 50.6) of study participants had good knowledge and 50% (95% CI: 45.9, 53.7) had a positive attitude towards COVID-19 vaccination. Having comorbidity disease and being male were significantly associated with good knowledge. In addition, being married, being a health science student, being exposed to mass media, having a good knowledge of COVID-19 vaccination, and having paternal primary education were significantly associated with a positive attitude towards COVID-19 vaccination.

Conclusion: In general**,** knowledge and attitude towards COVID-19 vaccination among college students are low. Comorbidity disease and sex were predictors of COVID-19 vaccination knowledge, whereas, marital status, category of college students, mass media, paternal education and knowledge about COVID-19 vaccination were predictors of COVID-19 vaccination attitude. Alleviating participants' concerns and improving their confidence through health education is crucial.

Keywords

attitude, college students, COVID-19 vaccination, Ethiopia, knowledge

Introduction

Coronavirus disease 2019 (COVID-19) is a new strain infection which is caused by severe acute respiratory syndrome coronavirus 2 (SARSCOV-2). It was declared as a pandemic in March 2020 by the World Health Organization (WHO).[1] Beyond human mortality and morbidity, the pandemic had a serious impact on economic and social crises across the globe.[2] It is a fatal, serious, and highly contagious disease from human to human primarily by direct contact and respiratory secretions.[3] As of November 29, 2021 report, more than 261 million people have been infected by COVID-19 pandemic and more than 5 million of them have died worldwide.[4]

Providing safe and efficacious vaccines are life-saving inventions that have been responsible for the eradication and prevention of many infectious diseases in the world.[5, 6] It is widely acknowledged that if most of the population is

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immunized to that particular infection, they indirectly protect the unvaccinated individuals.[6, 7]

Of the variety of COVID-19 prevention measures, vaccination is the most effective preventive method against severe disease and death.[8] After the happening of the COVID-19 pandemic, several scientist teams and WHO are working on the development of vaccines.[9,10] The development of this vaccine against COVID-19 has been much accelerated than the development of any other vaccine in different parts of the world.[11,12] Surprisingly, within less than 12 months, there were more than 100 vaccines in pre-clinical development and more than 60 vaccines have been permitted for use in different countries.[11–13]

Despite the development of successful SARSCOV-2 vaccine within a short period and continuing vaccine supply, vaccine hesitancy is becoming a threat to public health.[14–16] Vaccine hesitancy, which is quite dominant in Africa, including Ethiopia offers an opportunity to COVID-19 re-outbreak and WHO listed it as one of the top ten threats to global health.[17,18] Evidence showed that only 60.5% of the population have received the COVID-19 vaccine in the world.[19] As of November 24, 2021 report, about 5.4 million people have been vaccinated in Ethiopia.[20] Evidence exhibits that this vaccine hesitancy is supposed to re-inflate the COVID-19 epidemic and drop vaccine coverage.[21]

The first shipment of the AstraZeneca vaccine arrived in Ethiopia on March 6, 2021, via COVAX facility and the ministry of health of Ethiopia launched the COVID-19 vaccination giving a priority for healthcare workers.[22] Currently, the Ethiopian ministry of health authorized a COVID-19 vaccination campaign targeting all people older than 12 years on November 25, 2021. To increase these vaccine uptakes, the ministry of health disseminate information and calls via messaging systems and mass media.[20] However, there is high COVID-19 vaccination hesitancy among the population globally including Ethiopia.[23] A study conducted in Dessie hospital showed that 62.5% of health care providers have good knowledge[24] and other study in Gurage zone, Ethiopia revealed that 74% of the general population have good knowledge towards COVID-19 vaccination.[25] A meta-analysis study in China showed that 51% of respondents had a positive attitude to COVID-19 vaccination.[26] Previous studies conducted in Debre Tabor and wolkite, Ethiopia, revealed that only 42.3% and 44.7% of the general population have a positive attitude towards COVID-19 vaccination, respectively.[25,27]

Study conducted in Egypt showed that 80.5% study participants did not know the availability of COVID-19 vaccine.[28] Another study also showed that participants having good knowledge about COVID-19 vaccine increases the acceptance of vaccination.[29] In addition, study done in Dessie city, Ethiopia revealed that participants having negative attitude towards COVID-19 vaccine increase hesitancy three times compared to their counter parts.[24]

Previous studies revealed that educational level, age, marital status, sex, screened for COVID-19, monthly pocket money, and residence were factors affecting knowledge and attitudes towards COVID-19 vaccination.[27,30–32] Evidence exhibits that certain groups of the population are at an increased risk of infections, like college students who live together and spent most of their time in crowded settings.[27]Scholars also revealed that college students are open-minded and respond public issues early and used as source of information and trust in vaccines to the society.[30,33]In addition, the judgment of educated people on the safety and effectiveness of the vaccine may affect the public attitude toward vaccination.[34] Also, this will add other dimensions to COVID-19 vaccine knowledge and opinion among young adults. As far as the author's deep review, there is no previous study published in Ethiopia. Therefore, the current study investigated the knowledge and attitude of students towards COVID-19 vaccination and associated factors in Gondar city, northwest Ethiopia.

Methods and Materials

Study Setting and Period

An institutional-based cross-sectional study was conducted from January 12 to 26, 2021 in Gondar city, northwest Ethiopia. Gondar city is located 166 km away from Bahir Dar, the capital city of Amhara regional state and 750 km northwest of Addis Ababa (the capital city of Ethiopia). There are 1 governmental referral hospital, 8 governmental health centers, 22 health posts, 1 private primary hospital, and 1 general hospital serving the community in the city. According to the population projection of Ethiopia for all regions at the Woreda level from 2014–2017, the total population of the city was estimated to be 306,246.[35] Currently, it has 4 public colleges which are Teachers Training College (TTC), Technical and Vocational Education and Training (TVET) 1 and 2, and one Health Science College (HSC). According to the official reports of governmental colleges, there were more than 12,000 students attending their education in face to face way.

Source Population

All regular college students attending their education in Gondar city.

Study Population

All selected students from randomly selected departments during the time of data collection were the study population.

Sample Size Determination

The single population proportion formula was used to calculate the minimum required sample size. So far, there has been no study on knowledge and attitude towards COVID-19 vaccine in the country. Therefore, the initial sample size was calculated by taking a 50% proportion at 95% level of confidence, and a 5% margin of error. Assuming a 1.5 designing effect and a 10% a non-response rate, a total of 634 sample size was obtained.

Sampling Procedure

A multistage sampling technique was used to select the study participants. First, Gondar city public colleges are stratified as health and non-health science colleges by considering the reference population is different. Then, the total sample size was proportionally allocated to 4 public colleges. Accordingly, the subsamples allocated to each college was: Teacher Training College (TTC) = 195, TVET1 = 97, TVET2 = 160, and HSC = 182. Again, the total number of departments in each college was specified. Accordingly, the number of departments in each college was: HSC = 6 departments, TTC = 6 departments, TVET1 = 8 departments and TVET2 = 6 departments. After that, a lottery method was used to select 25% of the perspective departments. Finally, proportional size allocation was made to each selected department, and a simple random sampling technique was employed to select the study participants (Figure 1).

Variables of the Study

College students' knowledge and attitude towards COVID-19 vaccination were the outcome variable, whereas age of students, year of study, category of students, residence, sex, religion, marital status, living condition, maternal education, paternal education, presence of comorbidity disease, have a smartphone, screened for COVID-19, monthly pocket money, family numbers, and mass media exposure.

Operational Definitions and Measurements

Knowledge about COVID-19 vaccine: Participants' knowledge about COVID-19 vaccine was measured by 8 questions. Each question contains three response, "Yes", "No" and "I don't know" and coded as 1 for correct and 0 for incorrect responses. Finally, all knowledge scores were computed and those study participants who responded above the mean score were considered as having good knowledge, whereas, below the mean value labeled as poor knowledge.[25]

Attitude towards COVID-19 vaccination: It is participants' attitude towards COVID-19 vaccination and measured by 12 items with five-point Likert scale (strongly agree, agree, no opinion, disagree, and strongly disagree) and the Likert scale has a different scoring system (1-5) based on the question type either positive or negative. For positive questions scoring system was, strongly agree = 5, agree = 4, neutral = 3, disagree = 2, and strongly disagree = 1 and for negative questions, the scoring system was the vise verse of positive questions. Then after each attitude score was added together to get a total attitude score, the mean value was calculated. Those students who score above the mean value were considered as having a positive attitude towards COVID-19 vaccination, whereas, below the mean value labeled as having negative attitude.[36]

Mass media exposure: Study participants were asked how often they watched television, read a newspaper, or listened to the radio. Respondents who responded at least once a week are considered to be regularly exposed to that form of media.[37]

Data Collection Tool and Procedure

A pre-tested, semi-structured, and standardized self-administered questionnaire was used to collect the data. The questionnaire was adapted after a detailed review of related literature.[17,18,32,38,39] The questionnaire contains socio-demographic characteristics, knowledge-related items, attitude-related items, and participants' health-related variables. The English version of the questionnaire was prepared first and translated to the local language (Amharic) with assistance of language expert and back English to keep its consistency. The data were collected by using four BSc midwives with the supervision of one MSc midwife with standard precautions of COVID-19 infection. The validity of the questionnaire was checked by conducting a pretest on 5% of the sample size out of the study area and corrective measures were taken accordingly. The reliability of knowledge and attitude was checked by calculating the Cronbach's alpha (α), and were found to be 0.762 and 0.842, respectively. One-day training was given for data collectors and supervisor about the techniques of data collection and supervision, respectively. The collected data were checked daily for completeness and accuracy.

Data Processing and Analysis

The collected data were coded, cleaned, and entered into Epi Info version 7.1.2.0 and exported to Statistical Package of Social Science (SPSS) version 20 for analysis. Texts, tables, and figures were used to describe categorical and nominal variables, whereas mean and standard deviations were used to summarize numerical data. Binary logistic regression analysis was fitted to identify candidate predictors and variables having a p-value of less than 0.25 in the bivariable logistic regression analysis were included in the multivariable logistic regression analysis to handle the possible effect of confounders. In the multivariable logistic regression analysis, the adjusted odds ratio (AOR) with 95% confidence interval (CI) was applied to assess the strength and direction of association. A p-value <0.05 was used for the statistical significance of the outcome variables. Hosmer Lemeshow goodness-of-fit test was performed to check the model fitness at p-value >0.05. The variance inflation factor (VIF) was used to check the multicollinearity assumption and VIF >10 infer multicollinearity.

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 (IRB) of the University of Gondar (**reference number**: V/P/RCS/05/767/2021.Written informed consent was obtained from each study participant after the purpose of the study was explained to each study subject. All data taken from the participants were kept strictly confidential.
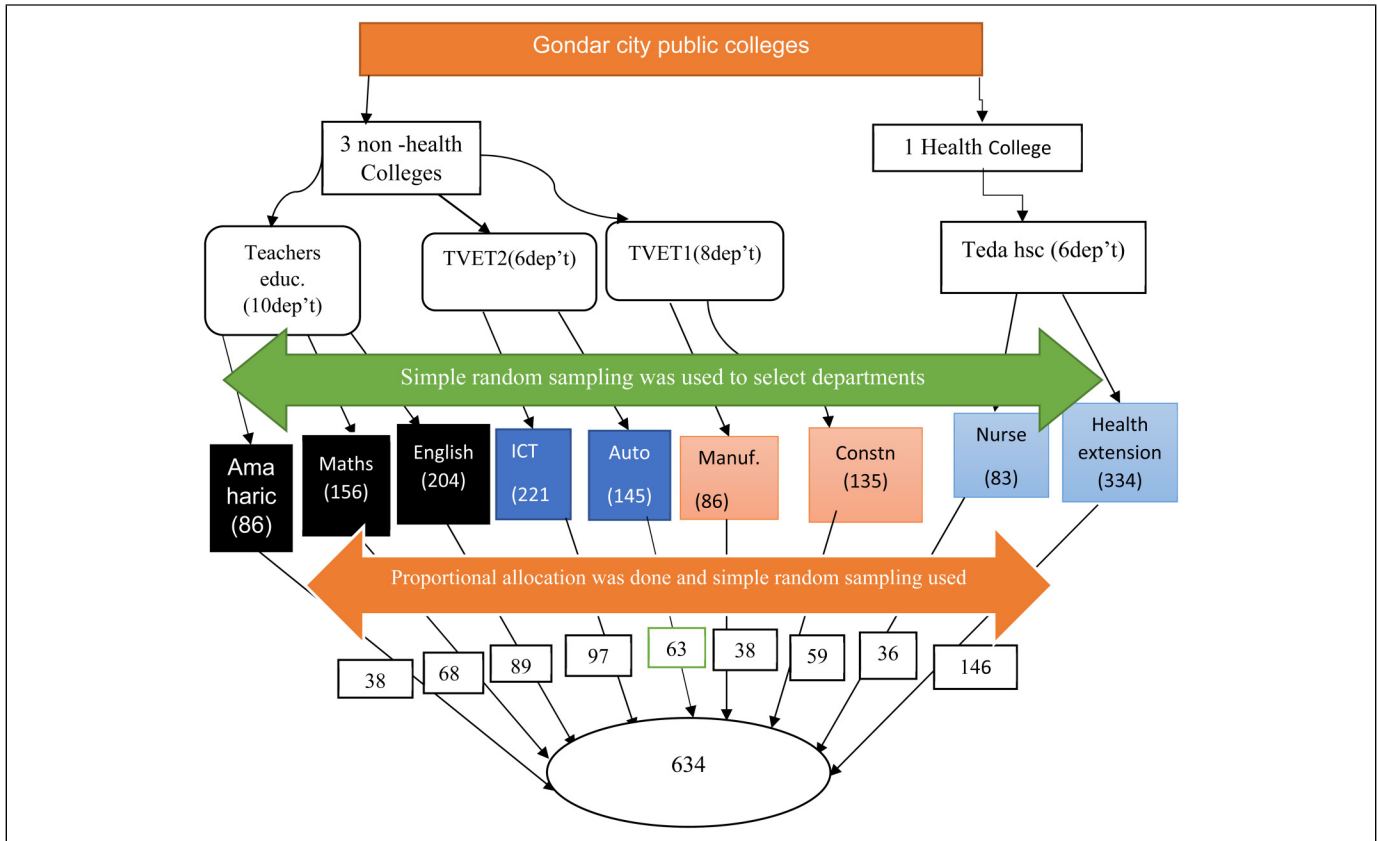
Figure 1. Schematic presentation of the sampling procedure to assess knowledge and attitude towards COVID-19 vaccination and associated factors among college students in gondar city, northwest Ethiopia, 2021.

Results

Socio-Demographic Characteristics of Study Participants

A total of 626 college students were participated in the study with a response rate of 98.7%. The minimum and maximum age of study participants was 18 and 30, respectively. The mean age of study participants was 23.01 (SD ± 4.155) years. More than two-thirds (68.8%) of the participants were found under the age group of 20–24 years. More than half (53.2%) of the study participants were third-year students and nearly three-fourths (74.9%) of study participants were urban residence. Also, less than one thirds (29.1%) of study participants were health science students. Nearly one-third (31.9%) of the study participants had screened for COVID-19 (Table 1).

Knowledge of Study Participants about COVID-19 Vaccination

From the total study participants, 46.8% (95% CI: 43.3, 50.6) had good knowledge about COVID-19 vaccinations). The mean score of knowledge was 5.48 with the standard deviation (SD) of 3.05. Five hundred thirty-six (85.6%) study participants have ever heard about COVID-19 vaccine. Nearly two-thirds (64.9%) of participants didn't know COVID-19 vaccine effectiveness. Also, approximately one-third (34.2%) of participants

did not know current availability of COVID-19 vaccines (Table 2).

Sources of Information about COVID-19 Vaccine

Health care providers were the main sources of information for about 45% of college students (Figure 2).

Factors Associated with Knowledge towards COVID-19 Vaccination

A multivariable logistic regression analysis has been performed to identify factors significantly associated with knowledge towards COVID-19 vaccination. Accordingly, students having comorbidity disease and being male were found to be independent predictors of knowledge of COVID-19 vaccination. On the other hand, marital status, age of students, presence of family victimed by COVID-19, and year of study were not significantly associated with knowledge of COVID-19 vaccination.

The odds of having good knowledge among students who had comorbidity disease was 2.76 times higher as compared to those students who didn't have comorbidity disease (AOR = 2.76; 95% CI: 1.28, 5.94). Likewise, the odds of having good knowledge among male students was 1.36 times higher

Table 1. Socio-Demographic Characteristics of College Students in Gondar City, Northwest Ethiopia, 2021 (n = 626).

Variables and categories	Frequency	Percent (%)
Year of study		
second year	257	41.1
third year	333	53.2
fourth years	36	5.8
Category of students		
Health science students	182	29.1
Non-health science students	444	70.9
Sex		
Male	278	44.4
Female	348	55.6
Marital status		
Married	126	20.1
unmarried	500	79.9
Live with		
alone	196	31.3
With friend	85	13.6
With family	345	55.1
Presence of comorbidity		
Yes	33	5.3
No	593	94.7
Maternal educational status		
Unable to read and write	269	43.0
Able to read and write	210	33.5
Primary education	68	10.9
Secondary education	26	4.2
College and above	53	8.5
Paternal educational status		
Unable to read and write	180	28.8
Able to read and write	251	40.1
Primary education	84	13.4
Secondary education	42	6.7
College and above	69	11.0
Have you use smart phone		
Yes	334	53.4
No	292	46.6
Family members		
<5	347	55.4
≥5	279	44.6
Mass media exposure		
Yes	202	32.3
No	424	67.7
Knowledge about COVID-19 vaccine		
Yes	293	46.8
No	333	53.2
Have you ever screened for COVID-19		
Yes	200	31.9
No	426	68.1
Monthly pocket money		
<1000ETB	481	76.8
1000-1,500ETB	70	11.2
≥1500ETB	75	12.0

Note: ETB: Ethiopian Birr.

Table 2. Knowledge Toward COVID-19 Vaccination among College Students in Gondar City, Northwest Ethiopia, 2021 (n = 626).

Knowledge items	Correct response (%)	Incorrect response (%)
Ever heard about COIVD-19 vaccine	536 (85.6)	90 (14.4)
Currently people taking COVID-19 vaccine	412 (65.8)	214 (34.2)
Know COVID-19 vaccine effectiveness	220 (35.1)	406 (64.9)
COVID-19 vaccine has disadvantage	258 (41.2)	368 (58.8)
COVID-19 vaccine increase immunity	325 (51.9)	301 (48.1)
Know COVID-19 vaccine side effect	290 (46.3)	336 (53.7)
Vaccine candidates are being developed	290 (46.3)	336 (53.7)
The vaccine can prevent COVID-19 infection	297 (47.4)	329 (52.6)

as compared to their counter parts of female students (AOR = 1.36; 95% CI: 1.09, 1.89) (Table 3).

Magnitude of Attitude towards COVID-19 Vaccination

In this study, about 50% of college students had a positive attitude towards COVID-19 vaccination (95% CI: 45.9, 53.7). The mean score of attitude towards COVID-19 vaccination was 38.82 with the SD of 8.59. The minimum and maximum score of attitude towards COVID-19 vaccination were 17 and 56, respectively. One-third (33.9%) of study participants agree that COVID-19 vaccine has no health problem. Nearly one-third (34.2%) of study participants agree to take COVID-19 vaccine without confusion and less than one-fifth (18.5%) of study participants agree the vaccine can reduce COVID-19 pandemic (Table 4).

Factors Associated with Attitude towards COVID-19 Vaccination

Bivariable and multivariable logistic regression analysis were done to identify factors associated with attitudes towards COVID-19 vaccination among college students. In the bivariable analysis, category of college students, number of families, presence of comorbidity, paternal education, knowledge about COVID-19 vaccine, mass media exposure, have smartphone, and marital status were associated with attitude towards COVID-19 vaccination at p-value of <0.25. In the multivariable logistic regression, factors like mass-media exposure, category of college students, knowledge about COVID-19 vaccine, paternal education, and marital status were significantly associated with attitude towards COVID-19 vaccination at p-value <0.05, whereas having comorbidity disease and family
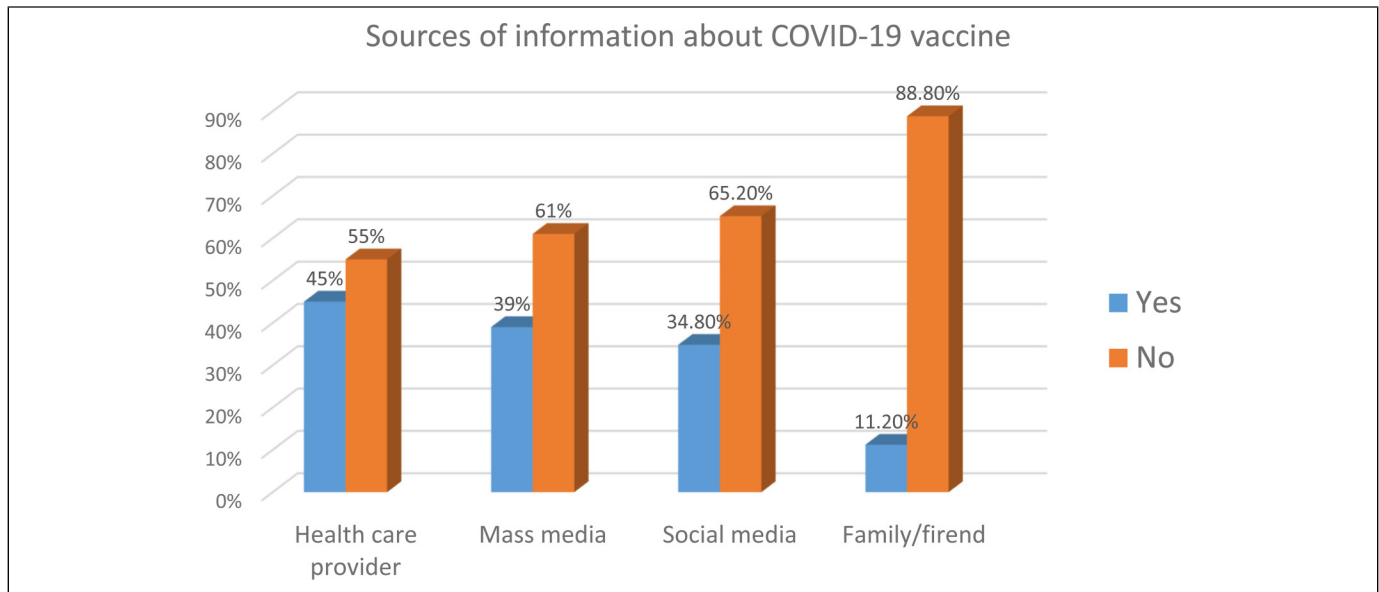
Figure 2. Sources of information for college students about COVID-19 vaccine ,northwest Ethiopia ,2021 (n = 626). *Note:* **Mass media** – *It is technology-based way of communication used to disseminate information to wide range of audience.* **Social media-** It is a computer-based technology that facilitates the sharing of ideas, thoughts, and information through virtual networks and communities.

members were not significantly associated with attitude towards COVID-19 disease.

This study revealed that the odds of having a positive attitude towards COVID-19 vaccination among mass media-exposed study participants were 2.44 (AOR = 2.44; 95% CI: 1.64, 3.63) times higher compared to their counterparts. In this study, being a health science student was 2.44 (AOR = 2.25; 95% CI: 1.52, 3.33) times higher having a positive attitude towards COVID-19 vaccination as compared to their counterparts. Likewise, study participants who had good knowledge about COVID-19 vaccine were 2.63 times more likely to have a positive attitude towards COVID-19 vaccination compared to their counterparts (AOR = 2.63; 95% CI: 1.81, 3.82). When compared to unmarried, married study participants were 1.74 times more likely to have a positive attitude towards COVID-19 vaccination (AOR = 1.74; 95% CI: 1.13, 2.65). Moreover, those study participants whose fathers had attended primary education were 1.85 times more likely to have a positive attitude towards COVID-19 vaccination compared to study participants whose fathers were unable to read and write (AOR = 1.85; 95% CI: 1.05, 3.24) (Table 5).

Discussion

The current study revealed that 46.8% of college students have good knowledge about COVID-19 vaccination. This finding is higher than studies conducted in China (39.3%)[40] and Wolaita Sodo, Ethiopia (40.8%).[38] The possible reason for the inconsistency might be differences in the study population, where this study was conducted in college students whereas studies in China and Wolaita Sodo were conducted in cancer patients and the general population, respectively. Students will have better

access and opportunity to get information about COVID-19 vaccine than the general population. However, this finding was lower than studies conducted in Bangladesh (57%)[17] and Dessie, Ethiopia (62.5%).[24] The possible reason for the discrepancy could be due to the variation in socio-demographic characteristics of the study participants, sample size, and study population. For instance, 82.6% of study participants in Bangladesh had university/higher educational level, whereas in our study, all study participants are below diploma level. In addition, Bangladesh study was conducted on 1658 participants whereas our study was conducted on 626 study participants. Moreover, the study participants in Dessie, Ethiopia were health professionals, whereas our study participants were college students. Evidence showed that health professionals had better awareness and attitude towards COVID-19 than the non-health professionals.[41]

In the current study, participants who had comorbidity disease were 2.76 times more knowledgeable about COVID-19 vaccination as compared to participants who did not have comorbidity disease. This could be explained by the fact that individuals who had comorbidity disease are at high risk for COVID-19 disease, access to health education and they might give high concern for their health. This, in turn, enforces them to search updated and gather different information about COVID-19 vaccine that would help to have good knowledge than those without comorbidities.

In addition, the odds of good knowledge towards COVID-19 vaccination among male students were 1.36 times higher as compared to their counter parts. This may be due to the fact that males are more exposed for different media and individuals than females that help to gather updated information about COVID-19 vaccine. Study showed that males are more willing to take COVID-19 vaccine whereas females prefer non-

Table 3. Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with Knowledge Towards COVID-19 Vaccination among College Students in Gondar City, Northwest Ethiopia, 2021 (n = 626).

Variables and category	Knowledge towards COVID-19 vaccination		COR (95% CI)	AOR (95% CI)
Sex	**Good**	**Poor**		
Male	145	133	1.47 (1.07,2.02)	1.36 (1.09,1.89) *
Female	148	200	1	1
Marital status				
Unmarried *	226	274	1	1
married	67	59	1.37 (0.93,2.03)	1.32 (0.87,1.99)
Age of students				
<20	25	28	1	1
20-24	184	247	0.83 (0.47,1.47)	0.77 (0.43,1.36)
≥25	84	58	1.62 (0.86,3.06)	1.41 (0.73,2.72)
Presence of comorbidity				
Yes	23	10	2.75 (1.28,5.88)	2.76 (1.28,5.94) *
No	270	323	1	1
Presence of family victimed by COVID-19				
Yes	8	15	0.59 (0.24,1.42)	0.49 (0.19,1.22)
No	285	318	1	1
Year of study				
second year	133	124	1	1
third year	144	189	0.71 (0.51,0.98)	0.77 (0.55,1.09)
fourth year	16	20	0.74 (0.37,1.50)	0.59 (0.28,1.24)

Note: COR-crude odds ratio, AOR-adjusted odds ratio, CI-confidence interval, 1-reference category, *p < 0.05 and Unmarried*: single, widowed, divorced.

pharmacological treatment for COVID-19;[42] this perception difference affects knowledge level of males and females.

Regarding attitude, about half of college students had a positive attitude towards COVID-19 vaccination which was in line with studies conducted in India community-based survey (50%)[43] and in Ethiopia among healthcare workers (50%).[44] However, this finding was higher as compared to studies done in Wolaita Sodo, Ethiopia (24.2%),[38] and France (25%).[45] The possible explanation for the observed variation might be the difference in study population and study time. In the current study, the study population was college students, whereas studies in Wolayita Sodo and France were the general population of the country and our study was conducted later after the information was distributed to the population compared to the aforementioned studies. This may create awareness and indirectly increase the positive attitude of college students. On the contrary, this finding was lower than studies conducted in united states (68%),[46] Pakistan (66.8%)[47] and Jordan (61%).[48] The possible reason for the inconsistency might be the difference in sample size, study population and socio–demographic characteristics like education and residence. For instance, study in Jordan was used 3100 sample size and more than half (53.8%) of the study participants were health professionals. Study showed that health professionals had deep knowledge about vaccine and better attitude towards COVID-19 vaccination compared to other populations.[27] This may affect the prevalence of positive attitude towards COVID-19 vaccination. Similarly, nearly two -thirds (59.6%) of study participants in Pakistan had Diploma and above level of education and 80.2% of the

study participants live in urban. People live in urban had better access to information about COVID-19 vaccine.

Regarding factors associated with attitude towards COVID-19 vaccination, study participants who were married had 1.74 times more likely to have a positive attitude towards COVID-19 vaccination compared to their unmarried counterparts. This might be married participants could exchange pertinent information with their husbands'/wives daily. Also, the absence of shared responsibility, information and motivation from the partner in unmarried participants may have an effect on their attitude.

This study revealed that those students whose fathers had primary education were 1.85 times more likely to have a positive attitude towards COVID-19 vaccination compared to those students whose fathers were unable to read and write. This may be due to the fact that individuals with higher formal education would be open minded and more likely to search different sources of information to updates themselves and their families compared to uneducated individuals. In addition, educated participants identify and access to reliable source of information which could help to reduce misconception, hesitancy and misinformation about the COVID-19 vaccine.

This study showed that health science students were 2.25 times more likely to have a positive attitude towards COVID-19 vaccination compared to non-health science students. This is supported by a study done in china.[30] The possible explanation could be health science students may get information about COVID-19 vaccine during their courses.

Table 4. Attitude Towards COVID-19 Vaccination among College Students in Gondar City, Northwest Ethiopia, 2021(n = 626).

Attitude items	strongly agree	Agree	neutral	disagree	strongly disagree
	n (%)	n (%)	n (%)	n (%)	n (%)
New COVID-19 vaccine has no health problem	99 (15.8)	212 (33.9)	149 (23.8)	51 (8.1)	115 (18.4)
Taking COVID-19 vaccine is important for us	47 ((7.5)	98 (15.7)	107 (17.1)	171 (27.3)	203 (32.4)
I will take COVID-19 vaccine without dilemma	63 (10.1)	214 (34.2)	132 (21.1)	89 (14.2)	128 (20.4)
COVID-19 will not be reduced	87 (13.9)	218 (34.8)	145 (23.2)	80 (12.8)	96 (15.3)
I will encourage my families /friends to take COVID-19 vaccine	71 (11.3)	123 (19.6)	123 (19.6)	131 (20.9)	178 (28.4)
COVID-19 vaccine should be distributed fairly	34 (5.3)	84 (13.4)	116 (18.5)	161 (25.7)	231 (36.9)
I feel COVID-19 vaccine is essential	58 (9.3)	132 (21.1)	173 (27.6)	112 (17.9)	151 (24.1)
COVID-19 vaccine can reduce COVID-19 pandemic	61 (9.7)	116 (18.5)	124 (19.8)	142 (22.7)	183 (29.2)
I support COVID-19 vaccine campaign	58 (9.3)	145 (23.2)	147 (23.5)	98 (15.7)	178 (28.4)
FDA should distribute safe and effective vaccine	10 (1.59)	137 (21.9)	115 (18.4)	130 (20.76)	134 (37.4)
COVID-19 vaccine side effects hesitate me to vaccination	110 (17.6)	106 (16.9)	185 (29.6)	171 (27.3)	54 (8.6)
I don't take COVID-19 vaccine by payment	58 (9.3)	182 (29.1)	149 (23.8)	96 (15.3)	141 (2.5)

Abbreviation: FDA: Food and Drug Administration.

Table 5. Bivariable and Multivariable Logistic Regression Analysis of Factors Associated with Attitude Towards COVID-19 Vaccination among College Students in Gondar City, Northwest Ethiopia, 2021 (n = 626).

Variables	Attitude towards COVID-19 vaccination		COR (95% CI)	AOR (95% CI)
Category of students	**Positive**	**Negative**		
Health	106	76	1.59 (1.13, 2.26)	2.25 (1.52,3. 33)**
Non- health	207	237	1	1
Family members				
<5	165	182	0.80 (0.58, 1.10)	0.76 (0.54, 1.07)
≥5	148	131	1	1
Marital status				
Married	74	52	1.55 (1.05, 2.31)	1.74 (1.13, 2.65) *
Unmarried*	239	261	1	1
Having comorbidity disease				
Yes	20	13	1.57 (0.77, 3.22)	1.01 (0.46, 2.14)
No	293	300	1	1
Paternal educational status				
Unable to read and write	89	91	1	1
Able to read and write	124	127	0.99 (0.68, 1.46)	0.97 (0.64, 1.46)
Primary education	53	31	1.75 (1.03, 2.97)	1.85 (1.05, 3.24) *
Secondary education	16	26	0.63 (0.32, 1.25)	0.60 (0.28, 1.26)
College and above	31	38	0.83 (0.48, 1.46)	0.90 (0.49, 1.63)
Mass media exposure				
Yes	115	87	1.51 (1.08, 2.11)	2.44 (1.64, 3.63) **
No	198	226	1	
Knowledge about COVID-19 vaccine				
Good knowledge	169	124	1.79 (1.30, 2.46)	2.63 (1.81, 3.82) **
Poor knowledge	144	189	1	1

Note: COR-crude odds ratio, AOR-adjusted odds ratio, CI-confidence interval, 1-reference category*p < 0.05, p*<001 and Unmarried*: single, widowed, divorced.

This could have accredited to higher awareness of the significance of COVID-19 vaccines in get rid of the disease. Besides, Ethiopian health science students have taken their clinical practice and theory course in parallel.so they visit health institutions like hospitals and health centers and they notice their chance of infection is higher than non-health science students and would have higher desire for vaccination to save to their lives from COVID-19 disease.

The odds of having a positive attitude towards COVID-19 vaccination among mass media exposed students were 2.44 times higher compared to their counter parts. This finding is consistent with a previous study conducted in Wolayita Sodo,

Ethiopia.[38] This is due to the fact that study participants, who have accessed to mass media would have better national and international information about the vaccine. This may in turn influences participants' positive attitude towards COVID-19 vaccination.

The odds of having a positive attitude towards COVID-19 vaccination were 2.63 times higher among participants who had good knowledge of COVID-19 vaccine as compared to those participants who had poor knowledge of COVID-19 vaccine. This finding is consistent with a previous study conducted in Zimbabwe[49] and New York.[46] The possible reason could be due to the fact that knowledge about COVID-19 vaccine safety and effectiveness is likely to increase positive attitudes to get vaccinated.

Limitations of the Study

The cross-sectional nature of the study design might not possible to infer the cause and effect relationship between students' knowledge and attitude towards COVID-19 vaccination and its associated factors. Moreover, since we used self-administered questionnaire unconscientious response, difference in understanding and interpretation of the questionnaire might be happened. However, the study participants had been informed that their participation is crucial for the study, the information is anonymous, and kept confidential for the study purpose only. Also, the questionnaire was prepared in simple and precise way by local language.

Conclusion

In this study, less than half (46.8%) of study participants had good knowledge and half of students had a positive attitude towards COVID-19 vaccination. Having comorbidity disease and being male were significantly associated with knowledge about COVID-19 vaccination, whereas Category of college students, marital status, paternal education level, mass media exposure, and knowledge about COVID-19 vaccine were factors affecting the attitude of college students towards COVID-19 vaccination. Thus, health education programs and mass media coverage should be strengthened. Moreover, intervention strategies to reduce the gaps of knowledge and attitude towards COVID-19 vaccination could better provide special attention for those who had no comorbidity disease, students who had uneducated father, no mass media exposed, non-heath science students, unmarried once and females.

Author Contributions

MBA: involved in the conception and design of the study, MBA, WZT: participated in data collection, analyzed the data, drafted the manuscript, and approved the final version of the manuscript.

Ethical Approval

Ethical clearance was obtained from the school of midwifery under the delegation from the Ethical Review Board (IRB) of the University of Gondar. A formal letter of cooperation was written to each college by Gondar city health office.

Consent to Publish

Not applicable

Informed Consent to Participate

Written informed consent was obtained from study participants after they had been informed about the objective of the study. In the consent, statements about the potential risk, benefit, and confidentiality were included.

Availability of Data and Materials

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

Declaration of Conflicting Interests

Funding

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Supplemental material

Supplemental material for this article is available online.

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