ORIGINAL ARTICLE

SOCIO-DEMOGRAPHIC CORRELATION WITH KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD CORONAVIRUS DISEASE 2019 AMONG COLLEGE STUDENTS IN GONDAR TOWN, NORTHWEST ETHIOPIA: INSTITUTIONAL BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: *Despite many efforts taken, the COVID-19 pandemic continued as a global public health concern. Educational institutions are one of the risky areas for the spread of COVID-19. Hence, obedience to preventive measures is the most effective strategy. However, there are limited studies regarding the proposed topic in Ethiopia, particularly that reaching out to college students. Therefore, this study aimed to assess knowledge, attitude, and practice towards COVID-19 prevention among college students in Gondar town, northwest Ethiopia, 2021.*

Method: *An institution-based cross-sectional study was conducted among college students in Gondar town. A multistage sampling technique was used to select 626 students. A binary logistic regression model was fitted to identify associated factors and an adjusted odds ratio was used to measure the strength of the association.*

Result*: From the total study participants, 69.2% (95% CI: 65.7-73.0%) had good knowledge, 51 % (95%:47-54.8%) had a positive attitude, and 68.1 % (95% CI: 64.4-71.6%) had good practices towards COVID-19 prevention. Year of study, category of students, residence, living with family, and the family number were significantly associated with good knowledge. In addition, category of students, residence, maternal education, history of COVID-19 victim, and good knowledge were significantly associated with a positive attitude. Moreover, year of study, residence, living with family, maternal education, having good knowledge and a positive attitude to COVID-19 prevention were significantly associated with good practice.*

Conclusion: *The level of knowledge of the study participants about COVID-19 is high; however, their practice and attitude towards COVID-19 prevention found to be satisfactory and low, respectively. Hence, further awareness creation should be given for students to address the gap of knowledge, attitude, and practice.*

Keywords: *knowledge, attitude, practice, COVID-19, college students, Ethiopia*

INTRODUCTION

Coronavirus disease 2019 (COVID-19) is a novel coronavirus caused by a new strain of severe acute respiratory syndrome coronavirus 2 (SARS-COV-2), which is first identified at the end of December 2019 in Wuhan City, China (1). COVID -19 is thought to be originated from animals and studies revealed that SARS-CoV-2 is 96% similar to a bat coronavirus (2). Even though COVID-19 is likely to have originated from a zoonotic contagious disease, the majority of cases in the world show signs of human-to-human transmission (3–5).

As COVID-19 rapidly spread in both developed and developing countries, WHO declared it as a public health emergency of international concern on Janu-

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ary 30, 2020. Later, due to the continual rise in the number of affected countries, cases, and fatalities, WHO declared COVID-19 as a global pandemic on 11, March 2020 (6–8).

COVID-19 has mainly two routes of transmission either directly from close contact with an infected person or respiratory secretions (droplets). There is also a hypothesis in which the virus can transit through touching a surface, object, or the hand of an infected person that has been contaminated with respiratory secretions and then touching own mouth, nose, or eyes. Individuals who remain asymptomatic could also transmit the virus. However, the most common source of infection is symptomatic people (1,9,10).

COVID-19 cases manifest different clinical signs and symptoms from asymptomatic patients to septic shock and multi-organ dysfunction. The most common symptoms of patients include fever (98.6%), fatigue (69.6%), dry cough, and diarrhea. Some patients may also have symptoms of headache, muscle pain, sore throat, loss of taste or smell, and hemoptysis have complained(11,12). Patients having preexisting co-morbidities like diabetes, respiratory disease, cardiovascular disease, hypertension, and oncological complications have a higher case fatality rate (11,13,14).

Globally, COVID-19 has influenced different devastating problems to the human race including mortality and morbidity, and economic and social crisis (15,16). According to very recent Worldometer report on COVID-19, globally 85,180,385 cases were confirmed to COVID-19 of this 1,847,697 cases were deaths and 60,249,174 were recovered cases (17). In Africa, COVID-19 cumulative cases were 4,335,149, deaths 102,263, active cases 437,246, and 3,795,640 recovered cases (18). Furthermore, the Ethiopian Ministry of Health announced that the first COVID-19 case was detected on March 13, 2020 (19,20). As of 11 July 2021, a total of 276,984 COVID-19 cases, 4,343 deaths, and 261,979 recovered cases were registered in Ethiopia (21).

A study conducted in China among college students revealed that 84.62% of the participants had adequate knowledge of COVID-19 prevention (22). Another study done in Ethiopia among undergraduate students showed that the knowledge, attitude, and practice of COVID-19 prevention were 75.9%, 62.4%, and 56.8%, respectively (23).

Still the COVID-19 outbreak collapses the whole educational system throughout the world. Particularly college students living independently far from their parents and those who have no frequent follow-up and may not get updated information about COVID-19. Moreover, the presence of a single case within the class can exponentially disseminate the virus to the whole students and the community as well. Students' knowledge, attitude, and practice to COVID-19 prevention are the key methods to tackle the pandemic. As to the authors' deep review, there are limited studies in Ethiopia that identifies the level of knowledge, attitude, and practice (KAP) of students towards COVID-19 prevention. Hence, this study was aimed to assess the KAP of students towards COVID-19 prevention in Gondar town, northwest Ethiopia, 2021.

METHOD

Study design and setting: An institution-based cross -sectional study was conducted from January 12 to

26, 2021, among Gondar town public colleges. Gondar town is located 166 KM far from Bahir Dar, the capital city of Amhara regional state, and 748 KM from the capital of Ethiopia, Addis Ababa. According to the population projection of Ethiopia for all regions at the woreda level from 2014 - 2017, the total population of the town was estimated to be 306,246. Among these, 149,970 of the population were males (24). Currently, there are 4 public colleges in the town, including Teacher Training College (TTC), Technical and Vocational Education and Training (TVET) 1, and 2, and Teda Health Science College.

Population and eligibility criteria: The source population was all regular public college students attending their education in Gondar town. Sampled students from randomly selected departments in Gondar town colleges were the study population and students who have attended their education during the study period were included in the study.

Sample size determination and sampling technique: The sample size was determined using a single population proportion formula with the following assumptions: the proportion of knowledge, attitude, and practice towards COVID-19 prevention among students was taken-50% (since there was no similar study), 95% level of confidence, and 5% margin of error. Therefore,

$$(n) = \frac{(Z\alpha\ 2)^{2*} p(1-p)}{d^2} = \frac{(1.96)^{2*} 0.5*(1-0.5)}{(0.05)2} = 384.$$

After using a design effect 1.5 and none response rate of 10%, the final sample size was 634.

A multistage sampling technique was employed to reach the study participants. First, we stratified Gondar town colleges as health and non-health colleges because the reference population is different. Then the total sample size was proportionally allocated to 4 public colleges. Accordingly, the subsamples allocated to each college were: teacher training college (TTC) = 159, TVET2 = 45, TVET1 = 248, and health science college (Hsc) = 182. Again, the total number of departments in each college was specified. Accordingly, the number of departments in each college was: TTC = 6 departments, TVET1 = 8 departments, TVET2 = 6 departments and Hsc = 6 departments. After that, a simple random sampling technique was used to select the perspective departments (25%). Finally, proportional size allocation was done to each selected department, and a simple random sampling technique was used to select the study participants and a total of 626 students were completed the survey (**Figure1**).

Operational definitions

Good Knowledge: Those respondents who scored above the mean of knowledge questions were taken as having good knowledge towards COVID -19 prevention (25).

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 (25).

Good Practice: Those respondents who scored above the mean of practice questions were taken as having good preventive practice to COVID -19 (26).

Data collection instrument and procedure: The data were collected using a pre-tested, semi-structured, and self-administered questionnaire. The questionnaire was prepared by reviewing different published articles (23,27–30) and WHO guidelines (31). The questionnaire was first prepared in English and translated to the local language (Amharic) and back to English to keep its consistency.

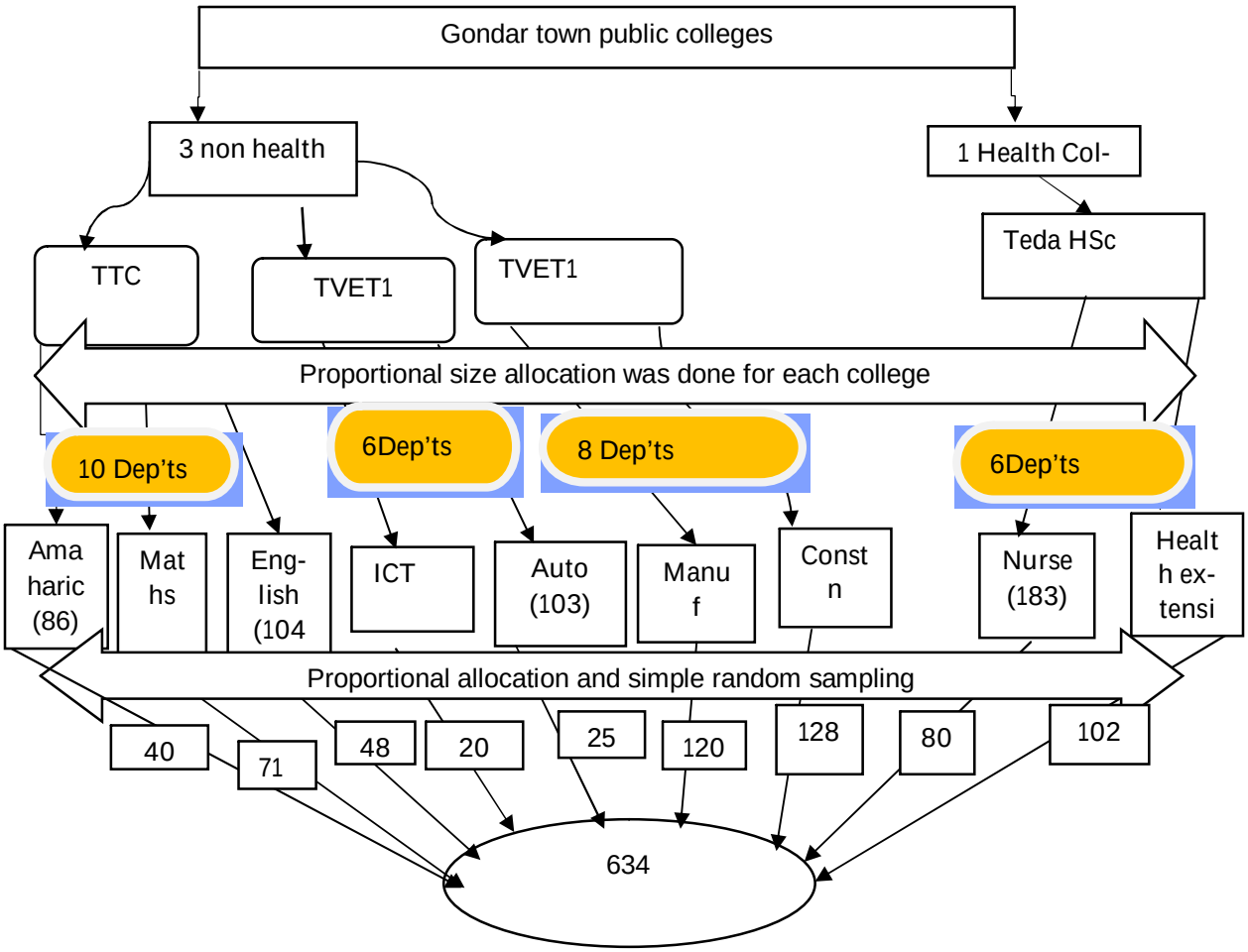

Figure1: *Schematic presentation of the sampling procedure to assess knowledge, attitude and practice towards COVID -19 prevention and associated factors among college students in Gondar town, northwest Ethiopia, 2021.*

The questionnaire includes socio-demographic characteristics, knowledge related (16 questions), attitude related (14 questions), and practice related (13 questions) of students. The questioner used for assessing knowledge and practice was answered on true /false and I don't know. Each response was scored as 1 for correct answer and 0 for incorrect / I don't know the answer. The attitude was measured using 14 questions/items with each response categorized based on Likert scale measurement and each Likert scale has a different scoring system (1-5) based on the question type either positive or negative. For positive questions, Likert scale scoring was strongly agreed (5), agree (4), no opinion (3), disagree (2), and strongly disagree (1) and for the negative questions scoring system the vise verse of positive questions applied. The attitude scores varied from 14 to 70. Individual knowledge, attitude, and practice scores were added together to get a total knowledge, attitude, and practice score, respectively. To classify participants as having good knowledge, positive attitude, and good practice, the mean knowledge, attitude, and practice scores were calculated and students having greater than mean score were considered as having good knowledge, positive attitude, and good practice towards COVID-19 prevention.

Four male BSc and one MSc midwife were participated in the data collection and supervision process, respectively by applying standard precaution of

COVID-19 prevention. Data collectors and supervisor were trained for one day about the techniques of data collection and supervision. In the meantime, the data collectors and supervisor were informed regarding important precautions to be taken to prevent COVID-19. Throughout the data collection, regular meetings were held among the data collectors, supervisor, and the principal investigator. The collected data were reviewed and checked for completeness before data entry and the incomplete data were discarded.

Data processing and analysis: Data were entered into Epi Info version 7.1.2. and exported to Statistical Package of Social Science (SPSS) version 20 for analysis. Bivariable and multivariable logistic regression were used to determine associated factors with knowledge, attitude, and practice towards COVID-19 prevention. Variables having a p-value of less than 0.25 in the bivariable analysis were included in the multivariable logistic regression to handle possible confounders. A p-value < 0.05 with a 95% confidence interval for the adjusted odds ratio was used to determine the level of significance.

RESULT

Socio-demographic characteristics: Out of 634 study participants, 626 were involved in the analysis and the response rate was 98.7%. The mean age of the students was 22.6 years old (±2.72 SD) and more than two-fifths (45.8%) of them were under the age group of 20-24 years. The minimum and maximum ages of the respondents were 18 and 30 years, respectively. Slightly more than half (53.2%) of the participants were third-year students. Most of the study participants 581 (92.8%) were Orthodox Christian and nearly three-fourths 469 (74.9%) of study participants were urban residence. More than half 345 (55.1%) of study participants were living with their family and more than three-fourths (76.8%) of the study participants had monthly pocket money of < 550 Ethiopia Birr (**Table 1**)**.**

Knowledge toward COVID-19 prevention and associated factors: Out of the total study participants, 69.2% (95% CI: 65.7-73.0%) had a good knowledge of COVID-19 prevention. Nearly three-fourths of the students 467 (74.6%) recognize that COVID-19 gets worse in Ethiopia. Four hundred seventy-six participants (76%) correctly answered the main cause of COVID-19. More than two-thirds of students 507 (81%) correctly respond that COVID -19 can be transmitted through discharges of an infected person **(Table 2**).

On the bivariate logistic regression analysis, factors like the year of study, category of students, residence, family number, monthly pocket money, maternal education, paternal education, and living with the family were significantly associated with knowledge of COVID-19 prevention. Multivariate logistic regression analysis showed statistically significant association of year of study, category of students, residence, living with family, and the number of the family with knowledge of COVID-19 prevention. Participants who were third year and fourth-year students were 4.55 (95% CI: 2.99-6.94), 3.07 (CI: 1.28-7.34) times more knowledgeable to COVID-19 prevention as compared to second-year students, respectively.

The odds of having a good knowledge of COVID -19 prevention were 1.89 times higher among health science students (95% CI: 1.10-3.25) as compared to non-health science students. In addition, students who live in urban were 2.91 (95% CI: 1.90-4.46)

times more knowledgeable as compared to students who live in rural areas. Participants who lived with family were 1.80 (95% CI:1.13-2.88) times more likely to have good knowledge of COVID-19 as compared to students living alone. Moreover, participants who are living in a family number of ≥ 5 were 38% less likely to be knowledgeable of COVID-19 prevention as compared to students who are living in a family number of ≤5 (AOR = 0.62; 95% CI:0.42-0.92) **(Table 3).**

Sources of information for COVID-19: More than three-fourths (89.9%) of study participants have ever heard about COVID-19. The main sources of information for the study participants were mass media (62.9%) and health professionals (42.7%) **(Figure 2).**

Attitude towards COVID-19 prevention and associated factors: As it is presented in Table 4, the proportion of positive attitude towards COVID-19 prevention was found to be 51.0% (95% CI: 47-54.8%). More than half of the study participants, 346 (55.2%) believe that they may be infected if they have contact with people working in a health facility. Overall study participants, 496 (79.2%) had a positive attitude to do voluntary tests for COVID -19. Nearly two-thirds of study participants 387 (61.8%) have trust in the information given by WHO and MoH.

Table 1: Socio-demographic characteristics of college students in Gondar town, northwest Ethiopia, 2021(n = 626)

Variables	Frequency	Percent (%)
Department		
Health	182	29.1
Non-health	444	70.9
Marital status of students		
Married	126	20.1
Unmarried	500	79.9
Educational status of mothers		
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 fathers		
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 been victim of COVID-19		
Yes	16	2.6
No	610	97.4
Screened for COVID-19 disease		
Yes	200	31.9
No	426	68.1

Table 2: Knowledge toward COVID-19 prevention among college students in Gondar town, Northwest Ethiopia, 2021 (n = 626)

Variables	Correct response n(%)	Incorrect response n(%)
Ever heard about COVID-19 pandemic?	563 (89.9)	63 (10.1)
COVID -19 can hurt all populations in the world	467 (74.6)	159 (25.4)
COVID -19 cases increase day today in Ethiopia	466 (74.4)	160 (25.6)
Cause of COVID-19 disease	476 (76.0)	150 (24.0)
A person with COVID-19 cannot infect others if she/he has no symptoms	485 (77.5)	141 (22.5)
COVID-19 can be transmitted from discharges of infected person	507 (81)	119 (19)
Children and young adults do not infect by COVID-19	428 (68.4)	198 (31.6)
main clinical symptoms of COVID-19	589 (94.1)	37 (5.9)
stuffy nose, runny nose, and sneezing are less common in COVID-19	211 (33.7)	415 (66.3)
Individuals with chronic disease are at risk for COVID-19	538 (85.9)	88 (14.1)
Do you think covid-19 has treatment?	205 (32.7)	421 (67.3)
Avoid overcrowded reduce COVID-19 transmission	577 (92.2)	49 (7.8)
Isolation & treatment of infected persons are effective	559 (89.3)	67 (10.7)
What will you do if contacts a COVID-19 infected person?	530 (84.7)	96 (15.3)
COVID-19 always causes death	431 (68.8)	195 (31.2)
Means of COVID -19 transmission	618 (98.7)	8 (1.3)
Antibiotics teat COVID-19	482 (77)	144 (23)
What will you do if have COVID-19 symptoms?	606 (96.8)	20 (3.2)

Table 3: Bivariate and multivariate analysis of factors associated with knowledge about COVID-19 among college students in Gondar town, northwest Ethiopia, 2021(n=626).

Variables	Knowledge of COVID-19		COR (95%CI)	P-value	AOR(95%CI)	P-value
	Knowl-edgeable	Not Knowl-edgeable				
Year of study						
Second year	131	126	1		1	
Third year	274	59	4.46 (3.076, 6.48)	0.000	**4.55 (2.99, 6.94)****	0.000
Fourth year	28	8	3.36 (1.47, 7.66)	0.004	**3.07 (1.28, 7.34)***	0.012
Category of students						
Health sciences	150	32	2.66 (1.73,4.09)	0.000	**1.89 (1.10, 3.25)***	0.020
Non-health sciences	283	161	1		1	
Residence						
Urban	348	121	2.43 (1.67, 3.54)	0.000	**2.91 (1.90,4.46)****	0.000
Rural	85	72	1		1	
Living						
Alone	125	71	1		1	
With friends	55	30	1.04 (0.61, 1.77)	0.881	1.16 (0.61, 2.19)	0.635
With family	253	92	1.56 (1.07, 2.27)	0.020	**1.80 (1.13, 2.88)***	0.013
Number of families			.			
<5	257	90	1		1	
≥5	176	103	0.59 (0.42, 0.84)	0.003	**0.62 (0.42,0.92)***	0.018

*COR-crude odds ratio, AOR-adjusted odds ratio, CI-confidence interval, 1-reference category*p<0.05,**p<0.001*

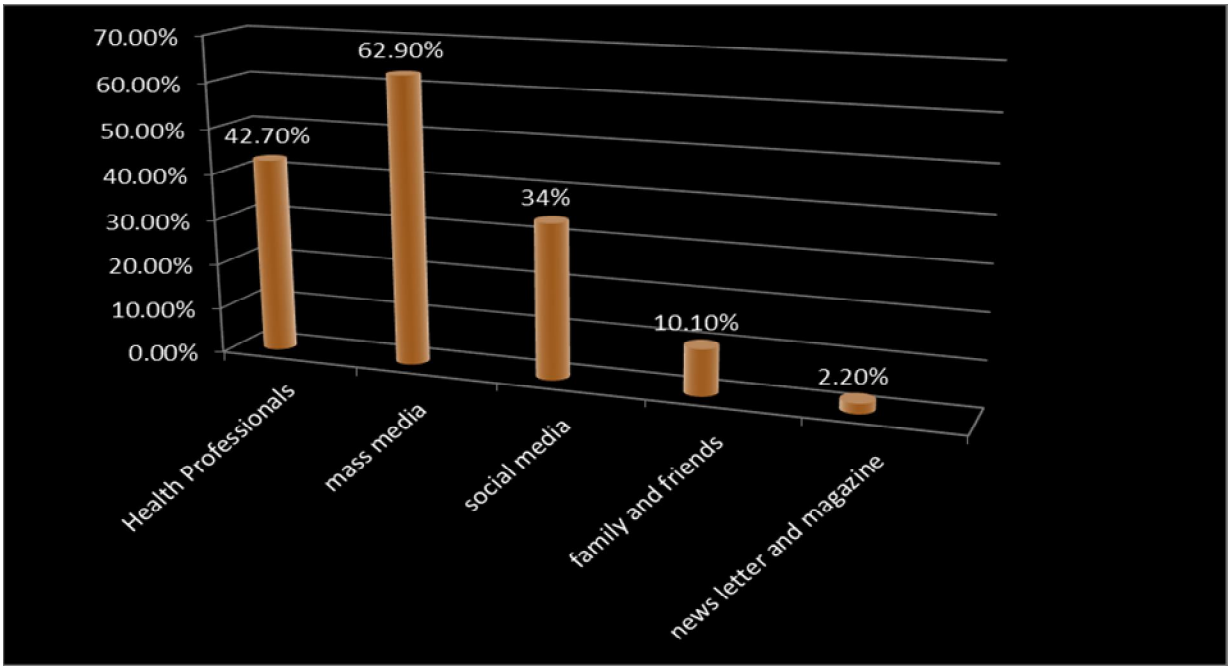

Figure 2: *Participants' sources of information about COVID-19 prevention at Gondar town, Northwest Ethiopia, 2021 (n=626).*

Table 4: Attitude toward COVID-19 prevention among college students in Gondar town, Northwest Ethiopia, 2021 (n = 626**).**

Attitude items	**strongly agree**	**agree**	**no opinion**	**disagree**	**strongly disagree**
	n (%)	n (%)	n (%)	n (%)	n (%)
Living with someone working in the health facility may contaminate you	200 (31.9)	146 (23.3)	100 (16.1)	123 (19.6)	57 (9.1)
I am confident to do voluntary test for COVID -19	335 (53.5)	161 (25.7)	60 (9.6)	54 (8.6)	16 (2.6)
If I have diseased other than COVID-19, will go to the hospital for treatment	380 (60.7)	165 (26.4)	33 (5.3)	31 (5.0)	17 (2.7)
I trust the information disseminated by the MOH and WHO about COVID-19	241 (38.5)	146 (23.3)	100 (16.0)	82 (13.1)	57 (9.1)
I am confident that Ethiopia can overcome COVID-19	231 (36.9)	138 (22.0)	117 (18.7)	87 (13.9)	53 (8.5)
In my opinion COVID-19 cases will increase	153 (24.4)	118 (18.8)	133 (21.2)	150 (24.0)	72 (11.5)
COVID-19 case can accurately diagnosed	215 (34.3)	204 (32.6)	86 (13.7)	87 (13.9)	34 (5.4)
COVID-19 case can be prevented	359 (57.3)	192 (30.7)	36 (5.8)	19 (3.0)	20 (3.2)
Standard precaution can protect us against COVID-19 disease	343 (54.8)	182 (29.1)	31 (5.0)	52 (8.3)	8 (2.9)
Regulations taken by the government are enough to combat COVID-19	106 (16.9)	105 (16.8)	83 (13.3)	226 (36.1)	106 (16.9)
I think COVID-19 is God punishment	316 (50.5)	94 (15.0)	76 (12.1)	84 (13.4)	56 (8.9)
COVID- 19 has impact on my education quality	388 (62.0)	143 (22.8)	26 (4.2)	46 (7.3)	23 (3.7)
I can meet someone who is cured of COVID -19 disease without any fear	205 (32.7)	164 (26.2)	66 (10.5)	133 (21.2)	58 (9.3)
I care from COVID -19 for only my safety	127 (20.3)	66 (10.5)	33 (5.3)	258 (41.2)	142 (22.7)

The bivariate logistic regression analysis revealed that age, year of study, category of students, residence, number of families, marital status, maternal education, paternal education, history of COVID-19 victim, screened for COVID-19, and knowledge about COVID -19 prevention had statistically significant association with the attitude of COVID-19 prevention. On the other hand, the multivariate analysis revealed that category of students, residence, maternal education, history of COVID-19 victim, and knowledge about COVID -19 prevention were significantly associated with a positive attitude towards COVID-19 prevention.

In this study, being a health science student was 1.8 (95% CI: 1.19-2.73) times higher having a positive attitude towards COVID-19 prevention compared to being a non-health science student. Being urban residence was 1.55 (95% CI: 1.02-2.38) times higher having a positive attitude towards COVID-19 prevention compared to their counterparts.

Students having mothers with educational level of secondary and above were 3.99 (95% CI: 1.22-13.04) times higher having a positive attitude towards COVID-19 prevention compared to study participants having mothers with unable to read and write.

The odds of having a positive attitude towards COVID-19 prevention among students having a history of COVID-19 victims were 4.91 times more than students having no history of COVID-19 victims (CI:1.39-17.39).

Participants who have good knowledge about COVID -19 were 4.44 (95% CI: 2.97-6.65) times more likely to have a positive attitude towards COVID-19 prevention than their counterparts **(Table 5).**

Table 5: Bivariate and Multivariate Factors Associated with Attitude towards COVID-19 prevention among College students in Gondar town, Northwest Ethiopia, 2021, (n=626).

Variables	Attitude of COVID-19 prevention		COR(95%CI)	p-value	AOR(95%CI)	p-value
	Positive attitude	Negative attitude				
Category of student						
Health sciences college	114	68	1.95 (1.37, 2.78)	0.000	**1.80 (1.19, 2.73)**	0.005
Non health sciences college	205	239	1	0.001	1	
Residence						
Urban	258	211	1.92 (1.33, 2.78)		**1.55 (1.02, 2.38)**	0.041
Rural	61	96	1		1	
Maternal education						
Unable to read and write	128	141	1		1	
Able to read and write	102	108	1.04 (0.72,1.49)	0.830	0.91 (0.61, 1.36)	0.661
Primary education	42	26	1.78 (1.03, 3.07)	0.038	1.43 (0.79, 2.57)	0.234
Secondary education	22	4	6.06 (2.03, 18.05)	0.001	**3.99 (1.22, 13.04)**	0.022
Collage and above	25	28	0.98 (0.55, 1.77)	0.956	0.67 (0.35, 1.30)	0.240
History of COVID-19 victim						
Yes	12	4	2.96 (0.94, 9.28)	0.063	**4.91 (1.39, 17.39)**	0.014
No	307	303	1		1	
Level of knowledge						
Goo Knowledge	272	161	5.25 (3.58-7.69)	0.000	**4.44 (2.97,6.65)****	0.00
Poor Knowledge	47	146	1		1	

*COR-crude odds ratio, AOR-adjusted odds ratio, CI-confidence interval, 1-reference category*p<0.05,p*<001*

Practice towards COVID -19 prevention and associated factors: Of the total study participants**,** 68.1% **(**95% CI: 64.4-71.6%) had good practice towards COVID-19 prevention with a mean practice score of 0.68(±0.46). Five hundred seventy-four (87.4%) students reported that they did not touch their eyes, mouth, and noses with unclean hands to prevent COVID-19 disease transmission **(Table 6).**

Table 6: Practice towards COVID-19 prevention among college students in Gondar town, Northwest Ethiopia, 2021, n=626

Variables	Correct response n (%)	Incorrect response n (%)
Avoid touching soft tissue to prevent COVID-19 disease	574 (87.4)	79 (12.6)
Covering the mouth and nose while coughing and sneezing to prevent COVID-19	544 (86.9)	82 (13.1)
Avoiding crowdedness to prevent COVID-19	505 (80.7)	121 (19.3)
cleaning and disinfecting surfaces to reduce COVID -19	523 (83.5)	103 (16.5)
Keep two-meter distances between people to prevent COVID -19	553 (88.3)	73 (11.7)
Appropriate facemask use to prevent COVID-19	540 (86.3)	86 (13.7)
Avoid direct contact with people for COVID-19 prevention	506 (80.8)	120 (19.2)
Wash hands with soap, water, or alcohol	561 (89.6)	65 (10.4)
Proper disposal of used materials to reduce COVID -19 distribution	514 (82.1)	112 (17.9)
Perform regular exercise to boost immunity	540 (86.3)	86 (13.7)
Use a balanced diet to reduce the chance of being infected by COVID-19 virus	402 (64.2)	224 (35.8)
Eating citrus fruits such as lemon to prevent COVID- 19 infection	56 (8.9)	570 (91.1)
Use of Traditional medicine for treatment of COVID -19	169 (27.0)	457 (73.0)

In the bivariate analysis, year of study, residence, living with family, maternal education, good knowledge, and positive attitude were significantly associated with practice towards COVID-19 prevention. In the multivariate logistic regression analysis, being a fourth-year student, urban residence, living with family, maternal education of able to read and write, good knowledge, and positive attitude were significantly associated with good practice towards COVID -19 prevention.

Participants who were fourth-year students were 3.54 (95% CI: 1.04-12.01) times more likely to have good practice towards COVID-19 prevention compared to second-year students. In addition, the odds of good practice towards COVID-19 prevention among urban residence were 1.65 (95% CI: 1.04-2.62) times higher compared to their counterparts. Also, participants who are living with their families were 1.94 (95% CI: 1.22-3.10) times more likely to have good practice towards COVID-19 prevention compared to participants who are living alone. In addition, those students whose mothers able to read and write were 45% less likely to have had good practice about COVID-19 prevention as compared to students whose mothers were unable to read and write (AOR = 0.55; 95% CI: 0.35-0.88). Moreover, the odds of good practice towards COVID-19 prevention among study participants who have good knowledge were 4.67 (95% CI: 2.99-7.30) times higher compared to participants who have poor knowledge. Lastly, the study participants who had positive attitude towards COVID-19 prevention were 3.56 (95% CI: 2.31-5.47) times more likely to have good practice compared to participants who had negative attitude **(Table 7).**

Table 7: Bivariate and multivariate analysis of factors associated with COVID-19 prevention practice among college students in Gondar town, northwest Ethiopia, 2021, n=626

Variables	Practice of COVID-19 prevention		COR (95% CI)	p-value	AOR (95%CI)	p-value
	Good practice	Poor practice				
Year of study						
Second year	144	113	1		1	
Third year	250	83	2.36 (1.66,3.35)	0.000	1.30 (0.84, 2.04)	0.292
Fourth year	32	4	6.28 (2.15,18.27)	0.001	**3.54 (1.04, 12.01)***	0.027
Residence						
Urban	341	128	2.43 (1.67, 3.54)	0.000	**1.65 (1.04, 2.62)***	0.034
Rural	85	72	1		1	
Living						
alone	119	77	1		1	
With friends	51	34	0.97 (0.57,1.63)	0.910	0.98 (0.53, 1.82)	0.957
With family	256	89	1.86 (1.28,2.71)	0.001	**1.94 (1.22, 3.10)***	0.005
Maternal Educational status						
Unable to read and write	179	90	1		1	
Able to read and write	125	85	0.74 (0.51, 1.07)	0.114	**0.55 (0.35, 0.88)***	0.012
Primary education	54	14	1.94 (1.02, 3.68)	0.043	1.10 (0.52, 2.35)	0.799
Secondary education	24	2	6.03 (1.39, 26.09)	0.016	2.11 (0.42, 10.55)	0.363
Collage and above	44	9	2.46 (1.15, 5.26)	0.020	2.16 (0.88, 5.26)	0.890
Level of knowledge						
Good knowledge	354	79	7.53 (5.15,11.04)	0.000	**4.68 (2.99, 7.30)****	0.000
Poor knowledge	72	121	1		1	
Level of attitude						
Positive attitude	270	49	5.33 (3.65,7.78)	0.000	**3.56 (2.31, 5.47)****	0.000
Negative attitude	156	151	1		1	

*COR-crude odds ratio AOR-adjusted odds ratio, CI-confidence interval, 1-reference category*p<0.05,p*<001*

DISCUSSION

In present study, 69.2% of study participants had good knowledge of COVID-19 prevention, which was in line with studies conducted in the Amhara region-70% (14), Addis Zemen, Ethiopia-66.1% (26), and Yemen-69.8% (32). However, this finding was lower than studies done in central Gondar-73.8% (33), Ethiopian higher education institutions-75.9% (23), and Ecuador-88% (34). This inconsistency might be differences in study population, socio-demographic factors, and sample size. The study participants in this study were college students, whereas studies in central Gondar and Ecuador included health care professionals. On the contrary, it was higher than studies done in Gondar town-60.7% (35), Mizan Tepi, Ethiopia-47% (36), and South Ko-

rea-56.5% (37). The discrepancy might be due to the differences in study time and study participants. In our study, participants' knowledge was assessed after the information was distributed through different media. But, the above mentioned studies were conducted at the early time of the COVID-19 pandemic.

In this study, health science students were 1.89 times more likely to have adequate knowledge of COVID-19 compared with their counterparts. Our finding is consistent with previous studies conducted in Mizan Tepi (36) and Ethiopian higher education institutions (23). The possible reason might be health science students are more familiar with similar diseases, health-related information, and scientific reading as compared to their counterparts.

Being an urban resident increases the odds of being knowledgeable by 1.65 times as compared to their counterparts. This finding is in agreement with studies conducted in the Amhara region (14), Addis Zemen hospital (26), and Cameron (9). This might be the reason that people who are living in urban might be educated and will have access to information about COVID-19.

The odds of having good knowledge of COVID-19 was 4.55 times higher among third-year students compared with second year students. This finding was supported by a study conducted in Ethiopia (23). This might be due to as educational levels increase, individuals try to search for different information and acquire more basic knowledge. The odds of having good knowledge among students living in family number ≥5 were 35% less likely as compared to their counterparts. The possible explanation could be as the number of family increase it might be difficult to pay attention to each child and low educational opportunities, which eventually result in poor academic performance(38). In addition, the odds of good knowledge of COVID-19 was 1.8 times higher among participants living with their families as compared to participants living alone. This could be participants who are living with their families could share additional information and become financially secure. This reduces their stress and helps to gather updated information (39).

In this study, about 51.0% of the participants had a positive attitude towards COVID-19 prevention, which was in line with studies done in Uganda-51.3% (40) and Ethiopia- 54% (36). However, it was higher than studies done in Sidama-37.5% (41) and Gondar town, Ethiopia (34.1%) (35). The discrepancy might be differences in the study population and time gap. On the contrary, it was lower than studies conducted in central Gondar (65.7%) (33), Amhara region (88%) (42), and Malaysia (83.1%) (43). The inconsistency might be due socio-demographic characteristics and study setting variations.

This study revealed that participants having maternal secondary education were 3.99 times more likely to have a positive attitude towards COVID-19 prevention. This is supported by a study done in Ethiopia (36). The possible reason might be parents' educational level may positively influence their children's behavior. Students who have good knowledge of COVID-19 had 4.44 times higher odds of positive attitude towards COVID-19 prevention than students who had poor knowledge. This was consistent with studies done in central Gondar (33) and Tigray (44). This could be due to the fact that knowledge is a key start-up to do any activity and shape the behavior of individuals. The odds of having a positive attitude

towards COVID-19 prevention among health science students were 1.8 times higher as compared to their counterparts. This finding is supported by a study done in Ethiopia (36). The possible reason might be health science students might have better information about COVID-19 and a higher level of understanding about the seriousness of the problem. Moreover, study participants who had a history of COVID-19 infection were 4.91 times more likely to have a positive attitude towards COVID-19 prevention as compared to their counterparts. This might be participants who had an experience of COVID-19 infection might clearly understand the severity of the problem, which in turn will shape participants' attitude towards COVID-19 prevention. Lastly, more than two-thirds (68.1%) of study participants had good practice of COVID-19 prevention. This finding was higher than studies done in, Sidama (24.4%) (41), Mizan Tepi (36), and Uganda (48.3%) (40). This discrepancy might be the time period difference of the study, socio-demographic, and study participants variation. On the other hand, this finding was lower than other studies conducted in Ethiopia (56.5%) (23), and Vietnam (75.8%) (45). This inconsistency might be the difference in socio-demographic factors and study participants.

In this study, students who had good knowledge of COVID-19 prevention were 4.68 times more likely to have good practice as compared to students who had poor knowledge. This result is supported by studies conducted in Mizan Tepi (36), and Vietnam (45). In addition, students who had a positive attitude towards COVID-19 prevention were 3.56 times more likely to have good practice as compared to students who had a negative attitude. This result is supported by studies in done China (46), and Vietnam (47). This could be participants who had a positive attitude towards COVID-19 will be more likely to comply with the COVID-19 prevention recommendations.

Limitation of the study: The cross-sectional nature of the study design might not possible to infer the cause and effect relationship between students' KAP and associated factors towards COVID-19 prevention.

CONCLUSION

More than two-thirds of study participants had good knowledge and practice towards COVID-19 prevention. In addition, about half of the participants had a positive attitude towards COVID-19 prevention. Year of study, category of students, residence, maternal education, history of COVID-19 victim, live with family, the number of families, good knowledge, and positive attitude to COVID-19 prevention were factors affecting KAP of college students towards COVID-19 prevention. Improving students' knowledge, attitude, and practice towards COVID-19 prevention through health education, training, preparing, and providing leaflets should be done particularly for non-health sciences students.

Declarations

Abbreviations and acronyms: AOR: Adjusted Odds Ratio; CI**:** Confidence Interval; COR: Crude Odds Ratio; COVID: Corona Virus Disease; IRB: Institution Review Board; KAP: Knowledge, Attitude and Practice; MOH: Ministry of Health; OR: odds ratio; SARS-CoV: Severe Acute Respiratory Syndrome Corona Virus; SPSS: Statistical Package of Social Science; TTC: Teacher Training College; TV: Television; TVET: Technical and Vocational

Education and Training; WHO: World Health Organization

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 with approval number**: V/P/ RCS/05/767/2021**. A letter of cooperation was obtained from the Gondar town education office and each college administrative office. Then written informed consent was obtained from each study subject after the purpose of the study was explained to each study participant. all data taken from the participants were kept strictly confidential and used only for the study purpose.

Consent to publish: Not applicable.

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

Competing interests: The authors declare that they have no competing interests.

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Authors' 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. WZT, DNG, BGK, AAK, MDA, and AEY approved the proposal with some revisions, participated in data analysis, and revised subsequent drafts of the manuscript, and approved the last version of the manuscript. All authors have read and approved the manuscript.

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