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Knowledge, Attitude, and Practice and Associated Factors towards COVID-19 among College Students in Amhara Region, Ethiopia; A Cross-Sectional Study

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Authors' Contributions

All authors conceived and designed the study. AWT, AA and NM supervised the data collection. AWT, SE, NM and MC performed the data analysis, interpretation of data, and drafted the manuscript and critically reviewed the manuscript. All authors read and approved the final manuscript.

Abstracts

Background: Ethiopia has taken unprecedented preventive measures like closure of higher education institutions to halt the spread of COVID-19. However, still, there is scarce information regarding the knowledge, attitude, and practice (KAP) of students towards COVID-19 pandemic. Thus, this study aimed to assess the KAP and associated factors of preventive measures against COVID 19 among students.

Methods: A cross-sectional study design was conducted among 422 students. The sample was proportionally allocated into the randomly selected four colleges and the students were recruited using a systematic random sampling technique. Variables with p-value < 0.25 in the bivariate logistic regression analysis were entered into the multivariable logistic regression model.

Results: this study involved 408 students with response rate of 96.6%. The level of good knowledge, positive attitude and good practice were 69.6%, 56.6% and 65% respectively. After adjusting for covariates; being in the late adolescent age group (16-20), living with > 5 family size, and being single were predictors of knowledge level. Besides, being single, learning Diploma (TVET) level trainings, and being year-two students were predictors of attitude levels. Similarly, urban residence, being regular students, and being year-one students were the independent predictors of practice level of students.

Conclusions: The national and local governments should develop effective and inclusive prevention strategies to address students who are at home due to COVID-19 pandemic.

Keywords: COVID-19, Knowledge, Attitude, Practice, Students, Amhara Region, Ethiopia

Introduction

Severe acute respiratory infection (SARS) is a group of respiratory tract infections caused by a beta coronavirus (SARS-CoV2) [1-3]. Corona Virus Disease-2019 (“COVID-19”) is a family of SARS caused by Novel Coronavirus and was first detected in December 2019 in Wuhan, China. Since it has been declared a global pandemic by the World Health Organization (WHO), it has made the rapid spread across the world and causes high mortality and morbidity [2-5]. Globally, there is an estimated number of 5.8 million cases and nearly half a million (362, 705) deaths at the end of May 2020 [6-9]. Following this pandemic, nations across the globe have taken different preventive measures. These include movement restriction, confinement to home, the closure of schools and other social services [10-17]. Hence, appropriate knowledge, attitude, and practices toward the preventive measures are mandatory to halt the spread of the COVID-19 outbreak in countries [18-21]. However, studies revealed that the communities have shown poor knowledge and negative attitude towards the preventive measures of COVID pandemic [22-24]. Besides, the studies conducted across the globe have been investigated the knowledge, attitude, and practices toward the preventive measures of COVID-19 pandemic predominantly focused on health care workers and patients [25-28].

Ethiopia has taken different prevention and control measures to halt the spread of COVID-19. These include school closure, stay at home, keep social and physical distances, putting hand washing basins in places where people use in common (banks, churches/mosques, markets), and establishment of state emergency at the national level [27, 29, 30]. However, there is no specific intervention to address the psychological impact of COVID 19 in the country.

Therefore, this study was intended to generate evidence regarding the prevalence of psychological problems due to COVID-19 and its determinants among college/university students.

Methods and Materials

Study Setting and Participants

The community-based cross-sectional study design was conducted from April 15-25, 2020 to assess knowledge, attitude, and practice level of students towards COVID-19. The study was conducted among students who were learning in the four randomly selected private and public

colleges and Universities, Namely; Dream Science and Technology College, Dandi Boru College, Unity University, and Dessie Health Science College. These higher institutions are found in South Wollo Zone, Dessie city administration. Dessie city administration is located 401Km away from the capital city of Ethiopia, Addis Ababa. The city has eight private colleges, one private University, and three public colleges which accommodate a total of 23,507 students in different fields of study.

All active students, registered second-semester academic calendar, and students 16 and above years of age were included in this study. However, students who were seriously ill during the data collection period were not included in this study.

The sample size was calculated for both determinant factors and levels of knowledge, attitude, and practice towards COVID 19. Then, the maximum sample size was considered for this study. Thus, the final sample size was determined using a single population proportion formula with assumptions: 5% type I error, 95% Confidence Intervals, 50% proportion for KAP level since no study in Ethiopia on this problems. Finally, the researchers added 10% to compensate for the non-response of participants and the final sample size became 422.

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

Where: n = required sample size, Z $\alpha/2$ = critical value for normal distribution at 95 % confidence level (1.96), p = proportion of KAP, and d = 0.05 (5 % margin of error).

A simple lottery method was applied to select the higher education institutions. Proportional sample allocation was employed to get the required sample size from each selected University/Colleges. And then a systematic random sampling technique was employed to get the study participant with their phone numbers from each teaching institutions' registrar offices. From the twelve colleges and universities found in Dessie city administration, three colleges and one university were randomly selected. The calculated sample size was proportionally allocated in each college based on the second-semester academic student number reports. To calculate the

required number of participants from each college, we multiplied the total number of students actively learning in each college by the sampling fraction (n/N). The sampling fraction is approximately equal to six for all colleges. Accordingly, every 6th participants were selected using a systematic random sampling technique from each college registrar office log-book.

Study variables:

Dependent variable: knowledge (good/poor), attitude (positive/negative), practice (good/poor).

Independent variables: sociodemographic characteristics (age, residence, sex, marital status, educational level, field of study, income, family size, religion), knowledge for attitude, knowledge and attitude for practice towards the preventive measures of COVID-19.

Data collection tools and Procedures

The questionnaire was adapted from studies conducted before this study [31-33] and modified into context. The questionnaire was developed in English language and it consists of sociodemographic characteristics, twenty items for knowledge, eight items for attitude and twelve items for practice level of preventive measures against COVID-19. The questionnaire was translated into the local language (Amharic) and back to English to keep its consistency. The tool was pretested on 5% (21 participants) of samples other than selected colleges those found in Woldia town and some amendments were made based on the pretest findings. The data was collected using both phone-call and personal interviews. Phone-call was used for students who are out of Dessie town. The study participants were approached by trained health professionals who were working out of the selected colleges.

Data management and analysis

The data were cleaned, coded and entered into Epi data version 3.1 software and exported to SPSS version 23.0 for analysis. The descriptive analysis was done and the results were presented using texts, frequency tables, figures and median with Interquartile range.

Bivariate logistic regression analysis was done to assess the association between the dependent variable with each independent variable. The socio-demographic factors with knowledge, attitude, and practice of preventive measures against COVID-19 were the included factors in the bivariate analysis. Thus, independent variables with p-value less than 0.25 were considered in the final model. Correlation between independent variables was assessed but we did not find any correlation between independent variables. The model fitness was also checked using Hosmer-Lemeshow model fit-ness test. Finally, multivariable logistic regression analysis was done to control potential confounders and to identify the factors associated with the KAP of students towards COVID-19. A statistical significance level was declared at a P-value of less than 0.05.

Operational Definitions

Knowledge level: students who were correctly answered 70% or more of the knowledge questions were considered as students with a good knowledge level while students who answered correctly below 70% of the knowledge questions were considered as having poor knowledge.

Attitude level: students who were correctly answered 70% or more (5.6/8) of the attitude questions were considered as students with a positive attitude while students who correctly answered below 70% of the attitude questions were considered as students with a negative attitude.

Practice level: students who were correctly answered 70% or more (8.5/12) of the practice questions were considered as students with good practice level while students who correctly answered below 70% of the practice questions were considered as students with poor practice.

Results:

Sociodemographic Characteristics of Participants

In this study, 408 participants were involved with a response rate of 96.6%. The median age of the participants was 21 years with three Interquartile Range (IQR). Of the total students; 155 (38.0%) were lived in the rural residence, 194 (47.5%) were females, 215 (52.7%) were learning TVET or Diploma level training and 340 (83.3%) were living with their families during the COVID-19 lockdown. In this study, the participants had a median of 5 total family size with 3 IQR (**Table 1**).

Source of information about COVID-19

In this study, 293 (71.8%) of the students have gotten information about COVID-19 from mass media (TV, magazines, news paper, radio) and nearly fifty percent (54.2%) of the participants have gotten information from social media (facebook, Instagram, whatsapp and telegram) (**Fig.1**).

Mode of Transmissions and Symptoms of COVID-19

In this study, 276 (67.6%) of the students said that air droplets from the infected persons can transmit the infection of COVID-19 to healthy individuals (**Fig. 2**). Similarly, 375 (91.9%), 343 (84.1%), and 324 (79.4%) of the participants said that patients with COVID-19 can present with fever, dry cough, and shortness of breath respectively (**Fig. 3**).

Prevention and Control Modalities of COVID-19 Pandemic

In this study, 338 (82.8%) of the students said that regular hand washing with water and soap can prevent COVID-19 pandemic. Similarly, 255 (62.5%) of the participants said that we can alter the transmission of COVID-19 by covering of mouth and nose while coughing or sneezing (**Fig.4**).

Students Knowledge level and Its Associated Factors

In this study, 284 (69.6%) [95% CI 65% 74.3%) of college students had good level of knowledge regarding COVID-19 pandemic.

Selection of variables to be entered into multivariable logistic regression model was done based on clinical significance, predictor variables with p-value less than 0.25 in the bivariate logistic regression, and absence of multi-collinearity between independent variables. The selected covariates include; age of respondents, residence, sex of participants, marital status, education enrollment type, study program, field of study, academic year, living conditions, and source of income for education were entered into the multivariable logistic regression analysis model. The multivariable logistic regression model was done with backward elimination methods.

In this study, the students who were in the age group (16-20 years) had twice higher odds of good knowledge level compared to those who were above 20 years old [AOR=1.78, 95% CI 1.07, 2.69]. Students who were living within more than five family members had 56% less likely to be knowledgeable upon COVID-19 pandemic compared to those living within small family sizes [AOR=0.44: 95% CI 0.28, 0.68]. Moreover, students who were single had 2.3 times greater odds of good knowledge compared to married students [AOR=2.30: 95% CI 1.09, 5.55]. However, residence, sex of participants, education enrollment type, study program, field of study, academic year, living conditions, and source of income for education were not found significantly associated with knowledge level of students towards COVID-19 pandemic (**Table 2**).

Students Attitude towards COVID-19 and Associated Factors

This study revealed that 230 (56.4%) [95% CI 51.2%, 61%] of college students had positive attitude in the prevention and control strategies of COVID-19 pandemic.

The multivariable logistic regression model was done with backward elimination methods. In this study, the odds of positive attitude among single students was 3-folds higher compared to married students [AOR=2.78, 95% CI 1.15, 6.68]. Students who were learning Diploma (TVET) level trainings had 73% less likely to have positive attitudes towards COVID-19 prevention and control measures compared to those were learning degree program trainings [AOR=0.27: 95% CI 0.17, 0.42]. Moreover, year-two students had 4-folds greater odds of positive attitude compared to year-four and above students [AOR=4.44: 95% CI 1.55, 12.68]. However, age of participants, residence, sex of participants, study program, field of study, living conditions, source of income for education, and knowledge level were not significantly associated with attitude level of students towards COVID-19 pandemic prevention measures (**Table 3**).

Students Practice Level towards COVID-19 and Associated Factors

This study revealed that 265 (65%) [95% CI 60, 70.1%] of college students had good level of prevention practice regarding COVID-19 pandemic.

In this study, the students who were living in urban residency had 3-times greater odds of good practice level towards COVID 19 prevention and control measures compared to those who were living in rural residency during the pandemic [AOR=2.89, 95% CI 1.85, 4.53]. A regular program students had 74% less likely to have good practice on the prevention and control measures compared to extension (evening) program students [AOR=0.26: 95% CI 0.18, 0.81]. Finally, year-one students had 83% less likely good practice on the prevention and control measures compared to year-four students [AOR=0.17: 95% CI 0.14, 0.82]. However, residence, sex of participants, education enrollment type, field of study, living conditions, source of income for education, knowledge level and attitude towards COVID 19 prevention and control measures were not significantly associated with knowledge level of students towards COVID-19 pandemic (**Table 4**).

Discussion

In this study, the overall good knowledge, positive attitude, and good practice towards preventive measures of COVID 19 among students were 69.6%, 56.6%, and 65% respectively.

In this study, the overall good level of knowledge regarding COVID-19 pandemic among college students was 69.6%. This finding is lower than studies conducted in Debre Birhan University (73.8%) [34], eight teaching hospitals Ethiopian (88.2%) [27], Indian medical students (94.5%) [31], eight countries of five continents (80.8%) determinants [35], Malaysia (80.5%) [36], Tanzania (84.4%) [37], Sudan (90.6%) [38], Pakistan (71.5%) [28]. The discrepancy might be due to differences in cut-values used to categorize the knowledge levels, sample size, and sociocultural various between study settings. However, this result is higher than a study conducted in Syrian residents (60%) [39], USA (58%) [40], Bangladesh (48.3%) (57.6%) (10%) [24, 41, 42], three Middle Eastern countries (66.1%) [43], Makerere University Teaching Hospitals (66%) [25], Pakistan (51.8%) [44]. The differences in level of knowledge have been subjected to variation in the cut-values (i.e. most of the previous studies had been used more than 80% to say good knowledge) while this study has been used 70% to categorized study participants

with a good level of knowledge. In addition, the discrepancies might be due to differences in sample size and study settings.

In this study, students in the late adolescent age group (i.e. 16-20 years) were twice more knowledgeable regarding COVID 19 compared to those who were above 20 years old. This finding is similar to a study done among Debre Birhan University students [34], Kingdom of Saudi Arabia [45], Tanzanian residents [37, 46], China [33], Medical college students in Uttarakhand, India [32]. Adolescents are very eager to know emerging new events including the new novel virus (COVID-19) than adults [47]. Hence, students in the late age group are more knowledgeable compared to adults.

This study showed that students living with less than five family members had 56% less likely to have good knowledge of COVID-19 pandemic than to those living within small family sizes. This finding is consistent with studies conducted in Bangladesh [46]. This could be justified by students from small family size may spent most of their time by watching movies than families with large members who are obligated to have common source of information that will help the whole family members. Thus, these people are more likely to get the information disseminated by the government compared to their counterparts.

In this study, single students had 2.3 times greater odds of good knowledge compared to married students. This finding is supported by a study conducted in eight countries to assess knowledge level and its sociodemographic determinants [35]. Hence, single students may have sufficient time [48] to acquire adequate information regarding COVID 19 compared to married individuals who are very busy in the care of the families.

This study revealed that 56.4% of study participants had a positive attitude towards the prevention and control measures of COVID-19 pandemic. This finding is lower than studies conducted in eight teaching hospitals, Ethiopia (94.7%) [27], Indian medical students (93.7%) [31], Syrian residents (63.5%) [39], Malaysian residents (83.1%) [36], Bangladesh (62.3%) [24], Sudan (81.8%) [38], 10 universities in Shaanxi Province, China (73.8%) [49], Uganda (72.4%) [50], and India (97.3%) [51]. However, this result is higher than the studies conducted in Pakistan (44%) [28], and Makerere University Teaching Hospitals (21%) [25]. The discrepancy may be subjected to variation in the cut-values to measure the positive and negative attitude levels. Besides, the discrepancies might be due to differences in sample size and study settings.

In this study, the odds of positive attitude among single students was 3-folds higher compared to married students. This finding is consistent with a study conducted in eight countries of five continents [35]. Consequently, single students might have adequate time [48] to listen and search relevant information regarding COVID 19. Thus, single students could have positive attitude towards COVID 19 compared to married individuals who have a very busy time taking care of the families.

This study revealed that students who were learning Diploma (TVET) level training had 73% less likely to have positive attitudes towards COVID-19 preventive measures compared to those who were learning degree program training. Moreover, year-two students had 4-folds greater odds of positive attitude compared to year-four and above students. When the education level of students increases, their attitude towards the preventive measures will increase. This is supported by the studies conducted in Debre Birhan University Undergraduate students [34], and Indonesian Undergraduate Students [52]. Thus, students with degree level training could have a higher attitude towards the preventive measures of COVID 19 than students studying lower-level training.

This study revealed that 265 (65%) [95% CI 60, 70.1%] of college students had a good level of prevention practice regarding COVID-19 pandemic. This finding is lower than a study done in Syria (73.8%) [39], Pakistan (80.5%) [44], Sudan (89.9%) [38], students in 10 universities in Shaanxi Province, China (87.9%) [49], Uganda (85.3%) [50]. However, this finding is higher than studies conducted in Debre Birhan University Undergraduate students (49.5%) [34], Bangladesh (55.1%) [24], Pakistan (57.3%) [28]. The differences in the practice of preventive measures could have been subjected to variation in the cut-off values to classify good or poor practice. For instance, most of the previous studies have been used above 80% scores to classify adequate practice while the current study has been used 70% and above to categorized study participants with a good level of practice. In addition, the discrepancies might be due to differences in sample size and study settings.

In this study, the students who were living in urban residency had 3-times greater odds of good practice level towards COVID 19 prevention and control measures compared to those who were living in rural residency during the pandemic. This finding is similar to studies conducted in Debre Birhan University Undergraduate students [34], Indonesian Undergraduate Students [52], Sudan [38], Nepalese residents [53].

This study revealed that regular program students had 74% less likely to have a good practice on the prevention and control measures compared to extension (evening) program students. Similarly, year-one students had 83% less likely good practice on the prevention and control measures compared to year-four students. This finding is similar to studies conducted in Debre Birhan University Undergraduate students [34], Indonesian Undergraduate Students [52]. Therefore, while the year of study increases the level of practice also increases [34]. Hence, year four students have a greater practice of preventive measures of COVID 19 compared to year-one students.

Limitation of the study: the study was done using a phone-call interview which may be prone to social desirability bias. Besides, the study was not involved adolescents in high schools and pre-college schools. Thus, it may not represent all of the adolescents in Dessie town. Moreover, the study also share the limitations of a cross-sectional study design.

Conclusions

In this study, the overall good knowledge, positive attitude, and good practice towards preventive measures of COVID 19 among students were below the WHO recommendation scores.

After adjusting for covariates; being in the late adolescent age group (16-20), living with > 5 family size, and being single were predictors of knowledge level. Besides, being single, taking Diploma (TVET) level trainings, and being year-two students were predictors of attitude levels. Similarly, urban residence, being a regular students, and being year-one students were the independent predictors of the practice level of students. Therefore, the Ministry of Sciences and Higher Education [MOSHE], regional education bureau, and local governments should develop effective strategies and interventions to address students who have a gap of KAP towards the preventive measures of COVID-19. Moreover, it is important to consider the educational enrollment types and academic years of the students during the interventions.

List of Abbreviations

AOR	Adjusted Odds Ratio
COR	Crude Odds Ratio
COVID 19	Corona Virus Diseases 19

DSTC	Dream Science and Technology College
FMOH	Federal Ministry of Health
KAP	Knowledge, Attitude, and Practice
MOSHE	Ministry of Sciences and Higher Education
WHO	World Health Organization

Declarations

Ethical Issues and Consent to Participate

The ethical approval was obtained from Dream Science and Technology Institutional Health Research Ethics Review Committee. Then, permission letter was written for selected Colleges for cooperation and support. We had obtained verbal consent from individual study participants before beginning of data collection. We avoided personal identifier to ensure confidentiality and anonymity of study participants.

Consent to publish

Not applicable

Availability of Data and Materials

All materials and data related to this article are included in the main document of the manuscript. However, if anyone has interested to have raw data, he/she can contact the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

Funding source

Not applicable.

Authors' Contributions

All authors conceived and designed the study. AWT, AA and NM supervised the data collection. AWT, SE, NM and MC performed the data analysis, interpretation of data, and drafted the manuscript and critically reviewed the manuscript. All authors read and approved the final manuscript.

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Annex I: List of Tables

Table 1: Sociodemographic characters of students in Amhara region, Ethiopia, 2020

List of Predictors	Category of variables	Frequency (n=408)	Percentage (%)
Age of participants (in years)	16-20	166	40.7
	More than 20	242	59.3
Residence	Urban	253	62.0
	Rural	155	38.0

Sex of the participants	Male	214	52.5
	Female	194	47.5
Marital status	Single*	360	88.2
	Married	48	11.8
Religion of the participants	Orthodox	207	50.7
	Muslim	183	44.9
	Others+	18	4.4
Type of Education enrollment	TVET (Diploma)	215	52.7
	Degree (First)	193	47.3
Program	Regular	377	92.4
	Evening (Extension)	31	7.6
Field of Study	Health related	233	57.1
	Business related	129	31.6
	Technology related	46	11.3
Academic year	Year I	151	37.0
	Year II	180	44.1
	Year III	58	14.2
	Year IV+	19	4.7
Living with;	Families	340	83.3
	Relatives	28	6.9
	Alone	21	5.1
	Others++	19	4.7
Total family size (including extended families)	< 5	198	48.5
	5+	210	51.5
Monthly income for education and other expenses (in ETB)	< 1000	349	85.5
	1000-1500	47	11.5
	> 1500	12	2.9

Keynote: Single+: living together, divorced, and widowed, Others+: Protestant, Catholic, Others++: friends, sister-in-law and son-in-laws

Table 2: Factors associated Knowledge level of students, Amhara region, Ethiopia, 2020

List of variable	Category of variables	Knowledge levels		COR (95% CI)	AOR (95% CI)
		Good (%)	Poor (%)		
Age category (in years)	16-20	126 (44.4)	40 (32.3)	1.67 (1.07, 2.61)	1.78 (1.07, 2.69)*
	> 20 years	158 (55.6)	84 (67.7)	1.00	1.00
Residence	Urban	182 (64.1)	71 (57.3)	1.33 (0.86, 2.05)	1.24 (0.77, 1.99)
	Rural	102 (35.9)	53 (42.7)	1.00	1.00
Sex of participants	Females	154 (54.2)	60 (48.4)	1.26 (0.82, 1.93)	1.18 (0.74, 1.89)
	Males	130 (45.8)	64 (51.6)	1.00	1.00
Marital status	Single	253 (89.1)	107 (86.3)	0.77 (0.41, 1.45)	2.30 (1.09, 5.55)*
	Married	31 (10.9)	17 (13.7)	1.00	1.00
Education enrollment type	Diploma (TVET)	146 (51.4)	69 (55.6)	0.84 (0.55, 1.29)	0.64 (0.36, 1.12)
	Degree (first)	138 (48.6)	55 (44.4)	1.00	1.00
Program	Regular	263 (92.6)	114 (91.9)	0.91 (0.41, 1.99)	1.65 (0.61, 4.48)
	Extension	21 (7.4)	10 (8.1)	1.00	1.00
Field of study	Health related	160 (56.3)	73 (58.9)	1.00	1.00
	Business	86 (30.3)	43 (34.7)	0.91 (0.57, 1.44)	0.71 (0.38, 1.32)
	Technology	38 (13.4)	8 (6.5)	2.17 (0.96, 4.87)	2.60 (0.93, 7.25)
Academic year	Year I	107 (37.7)	44 (35.5)	1.12 (0.40, 3.14)	1.87 (0.54, 6.46)
	Year II	123 (43.3)	57 (46.0)	0.99 (0.36, 2.75)	2.05 (0.58, 7.18)
	Year III	41 (14.4)	17 (13.7)	1.11 (0.36, 3.41)	2.46 (0.64, 9.43)
	Year IV+	13 (4.6)	6 (4.8)	1.00	1.00
Family size	< 5	121 (42.6)	77 (62.1)	0.45 (0.29, 0.69)	0.44 (0.28, 0.68)*
	5+	163 (57.4)	47 (37.9)	1.00	1.00
Living with;	Family	234 (82.4)	106 (85.5)	1.00	1.00
	Relatives	19 (6.7)	9 (7.3)	0.97 (0.42, 2.18)	0.63 (0.24, 1.67)
	Alone	15 (5.3)	6 (4.8)	1.13 (0.43, 3.00)	1.16 (0.34, 3.910)
	Others+	16 (5.6)	3 (2.4)	2.42 (0.69, 8.47)	3.32 (0.79, 13,95)
Monthly income for education (in ETB)	< 1000	237 (83.5)	112 (90.3)	1.00	1.00
	1000-1500	39 (13.7)	8 (6.5)	2.30 (1.04, 5.09)	3.08 (1.36, 6.95)*
	> 1500	8 (2.8)	4 (3.2)	0.94 (0.28, 3.21)	1.27 (0.36, 4.41)

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * - P-value < 0.05, Others+: friends, sister-in-law and son-in-laws,

Table 3: Factors associated attitude of students towards COVID-19

List of variable	Category of variables	Attitude level		COR (95% CI)	AOR (95% CI)
		Positive (%)	Negative (%)		
Age category (in years)	16-20	87 (37.8)	79 (44.4)	0.76 (0.51, 1.13)	0.62 (0.37, 1.03)
	> 20 years	143 (62.2)	99 (55.6)	1.00	1.00
Residence	Urban	150 (65.2)	103 (57.9)	1.36 (0.91, 2.04)	1.15 (0.71, 1.85)
	Rural	80 (34.8)	75 (42.1)	1.00	1.00
Sex of participants	Females	124 (53.9)	90 (50.6)	1.14 (0.77, 1.69)	1.37 (0.85, 2.20)
	Males	106 (46.1)	88 (49.4)	1.00	1.00
Marital status	Single	208 (90.4)	152 (85.4)	1.62 (0.88, 2.96)	2.78 (1.15, 6.68)*
	Married	22 (9.6)	26 (14.6)	1.00	1.00
Education enrollment type	Diploma (TVET)	93 (40.4)	122 (68.5)	0.31 (.21, 0.47)	0.27 (0.17, 0.42)*
	Degree (first)	137 (59.6)	56 (31.5)	1.00	1.00
Program	Regular	214 (93.0)	163 (91.6)	1.23 (0.59, 2.56)	1.26 (0.48, 3.27)
	Extension	16 (7.0)	15 (8.4)	1.00	1.00
Field of study	Health related	110 (47.8)	123 (69.1)	1.00	1.00
	Business	91 (39.6)	38 (21.3)	2.67 (1.69, 4.23)	1.58 (0.85, 2.94)
	Technology	29 (12.6)	17 (9.6)	1.91 (0.99, 3.66)	2.26 (0.95, 5.41)
Academic year	Year I	73 (31.7)	78 (43.8)	1.29 (0.49, 3.38)	2.18 (0.76, 63)
	Year II	118 (51.3)	62 (34.8)	2.62 (1.01, 6.84)	4.44 (1.55, 12.68)*
	Year III	31 (13.5)	27 (15.2)	1.58 (0.55, 4.49)	1.77 (0.57, 5.44)
	Year IV+	8 (3.5)	11 (6.2)	1.00	1.00
Family size	< 5	114 (49.6)	84 (47.2)	1.11 (0.74, 1.62)	1.46 (0.91, 2.34)
	5+	116 (50.4)	94 (52.8)	1.00	1.00
Living with;	Family	194 (84.3)	146 (82.0)	1.00	1.00
	Relatives	14 (6.1)	14 (7.9)	0.75 (0.35, 1.63)	0.47 (0.18, 1.22)

	Alone	11 (4.8)	10 (5.6)	0.83 (0.34, 2.01)	0.67 (0.22, 2.04)
	Others+	11 (4.8)	8 (4.5)	1.03 (0.41, 2.64)	0.84 (0.27, 2.66)
Monthly income for education (in ETB)	< 1000	195 (84.8)	154 (86.5)	1.00	1.00
	1000-1500	30 (13.0)	17 (9.6)	1.39 (0.74, 2.62)	2.22 (0.93, 5.26)
	> 1500	5 (2.2)	7 (3.9)	0.56 (0.18, 1.81)	0.78 (0.19, 3.14) 0.29 (0.17, 0.48)
Knowledge	Poor	47 (20.4)	77 (43.3)	0.34 (0.22, 0.52)	0.31 (0.19, 0.48)*
	Good	183 (79.6)	101 (56.7)	1.00	1.00

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * - P-value < 0.05, Others+: friends, sister-in-law and son-in-laws.

Table 4: Factors associated practice level of students in Amhara region, Ethiopia, 2020

List of variable	Category of variables	Practice levels		COR (95% CI)	AOR (95% CI)
		Good (%)	Poor (%)		
Age category (in years)	16-20	102 (38.5)	64 (44.8)	0.77 (0.51, 1.16)	1.06 (0.63, 1.76)
	> 20 years	163 (61.5)	79 (55.2)	1.00	1.00
Residence	Urban	189 (71.3)	64 (44.8)	3.07 (2.01, 4.68)	2.89 (1.85, 4.53)*
	Rural	76 (28.7)	79 (55.2)	1.00	1.00
Sex of participants	Females	145 (54.7)	69 (48.3)	1.29 (0.86, 1.94)	1.15 (0.71, 1.85)
	Males	120 (45.3)	74 (51.7)	1.00	1.00
Marital status	Single	227 (85.7)	133 (93.0)	0.45 (0.22, 0.93)	0.86 (0.32, 2.27)
	Married	38 (14.3)	10 (7.0)	1.00	1.00
Education enrollment type	Diploma (TVET)	131 (49.4)	84 (58.7)	0.68 (0.45, 1.03)	0.81 (0.45, 1.43)
	Degree (first)	134 (50.6)	59 (41.3)	1.00	1.00
Program	Regular	238 (89.8)	139 (97.2)	0.25 (0.18, 0.74)	0.26 (0.18, 0.81)*
	Extension	27 (10.2)	4 (2.8)	1.00	1.00
Field of study	Health related	146 (55.1)	87 (60.8)	1.00	1.00
	Business	85 (32.1)	44 (30.8)	1.15 (0.73, 1.81)	0.71 (0.38, 1.33)
	Technology	34 (12.8)	12 (8.4)	1.68 (0.83, 3.43)	0.63 (0.25, 1.53)
Academic year	Year I	85 (32.1)	66 (46.2)	0.15 (0.12, 0.67)	0.17 (0.14, 0.82)*
	Year II	113 (42.6)	67 (46.9)	0.19 (0.14, 0.88)	0.22 (0.14, 1.05)
	Year III	50 (18.9)	8 (5.6)	0.73 (0.14, 3.81)	0.84 (0.15, 4.52)

	Year IV+	17 (6.4)	2 (1.4)	1.00	1.00
Family size	< 5	126 (47.5)	72 (50.3)	0.89 (0.59, 1.34)	0.72 (0.45, 1.17)
	5+	139 (52.5)	71 (49.7)	1.00	1.00
Living with;	Family	207 (78.1)	133 (93.0)	1.00	1.00
	Relatives	24 (9.1)	4 (2.8)	3.85 (1.31, 11.36)	3.50 (1.13, 10.83)*
	Others+	34 (12.8)	6 (4.2)	3.64 (0.89, 8.29)	1.42 (0.44, 4.57)
Monthly income for education (in ETB)	< 1000	219 (82.6)	130 (90.9)	1.00	1.00
	1000-1500	38 (14.3)	9 (6.3)	2.51 (1.17, 5.35)	1.21 (0.44, 3.31)
	> 1500	8 (3.0)	4 (2.8)	1.18 (0.35, 4.02)	0.44 (0.19, 2.16)
Knowledge level	poor	78 (29.4)	46 (32.2)	0.88 (0.57, 1.36)	1.04 (0.62, 1.74)
	Good	187 (70.6)	97 (67.8)	1.00	1.00
Attitude towards	Negative	113 (42.6)	65 (45.5)	0.89 (0.59, 1.34)	0.89 (0.54, 1.49)
	Positive	152 (57.4)	78 (54.5)	1.00	1.00

Key: COR- Crude Odds Ratio, AOR- Adjusted Odds Ratio, * - P-value < 0.05, Others+ (friends, alone, sister/son-in-laws).

Annex II: List of Figures

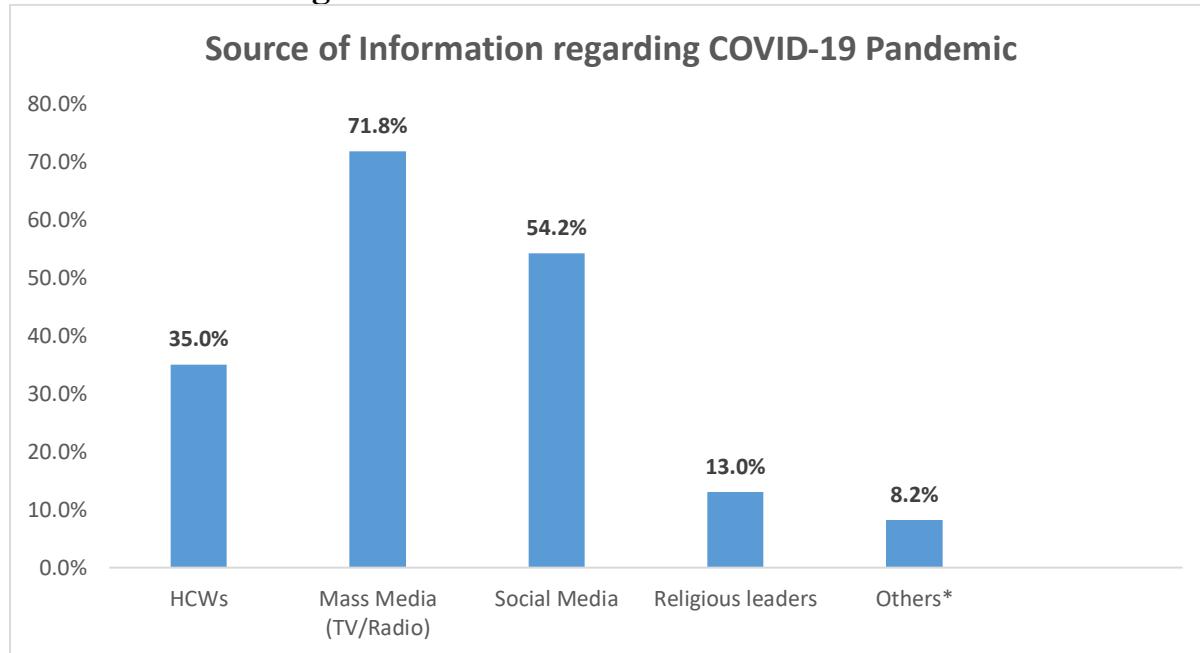


Figure 1: Source of information in which college students acquired information regarding COVID-19 pandemic, June 2020, Ethiopia.

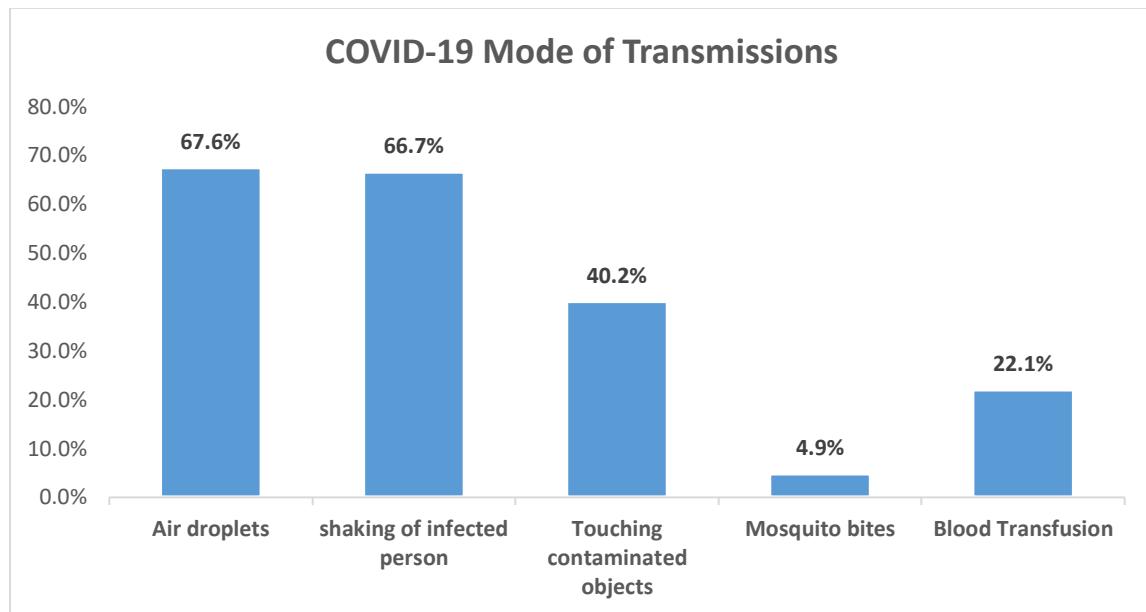


Figure 2: Students knowledge on the mode of transmission of COVID-19, June 2020, Ethiopia.

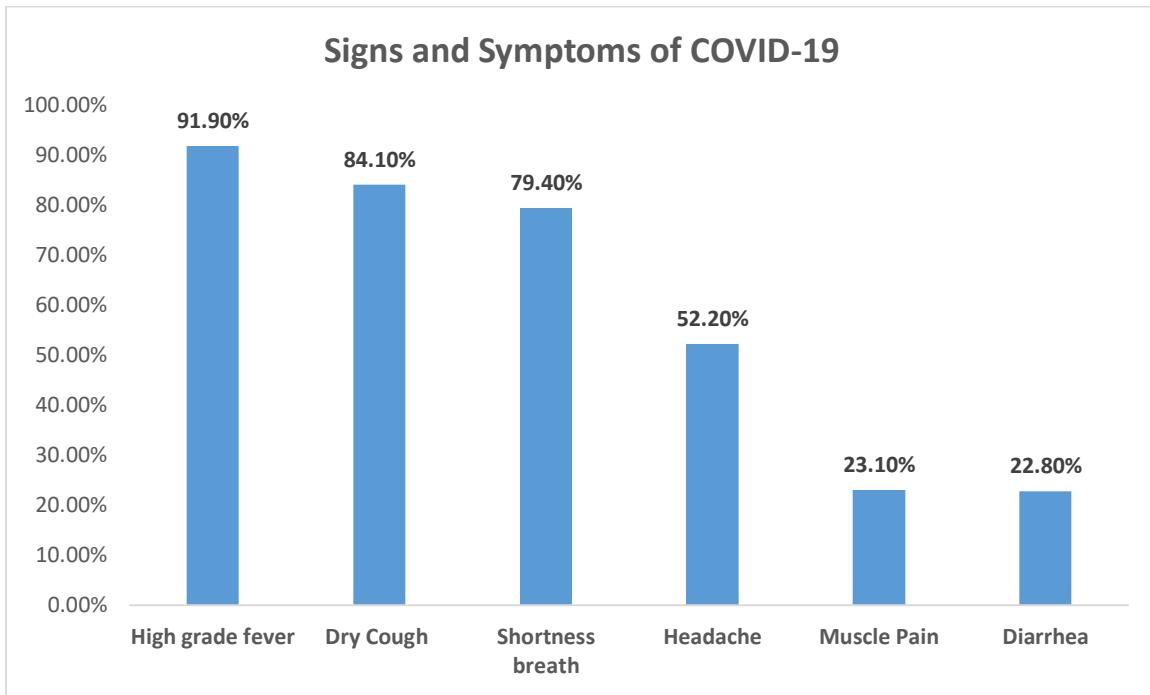


Figure 3: Students knowledge on the signs and symptoms of COVID-19, June 2020, Ethiopia.

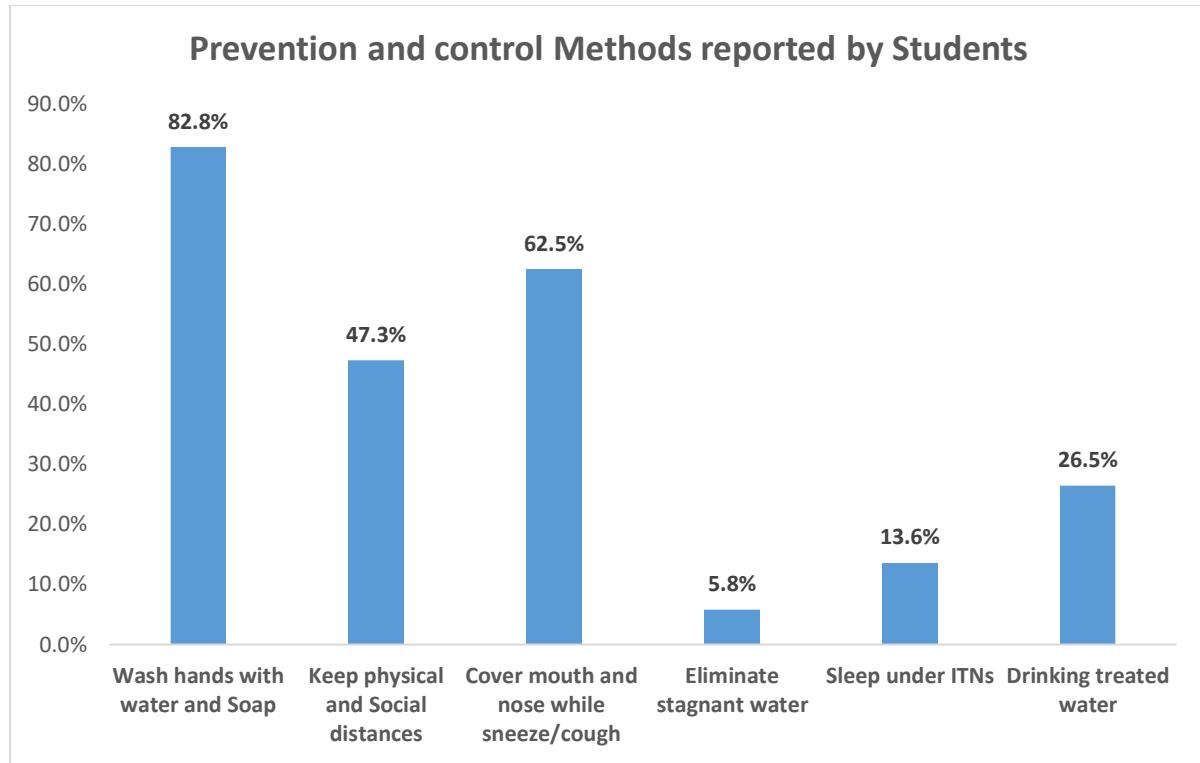


Figure 4: Students knowledge on the prevention and control modalities upon COVID-19.

Figures

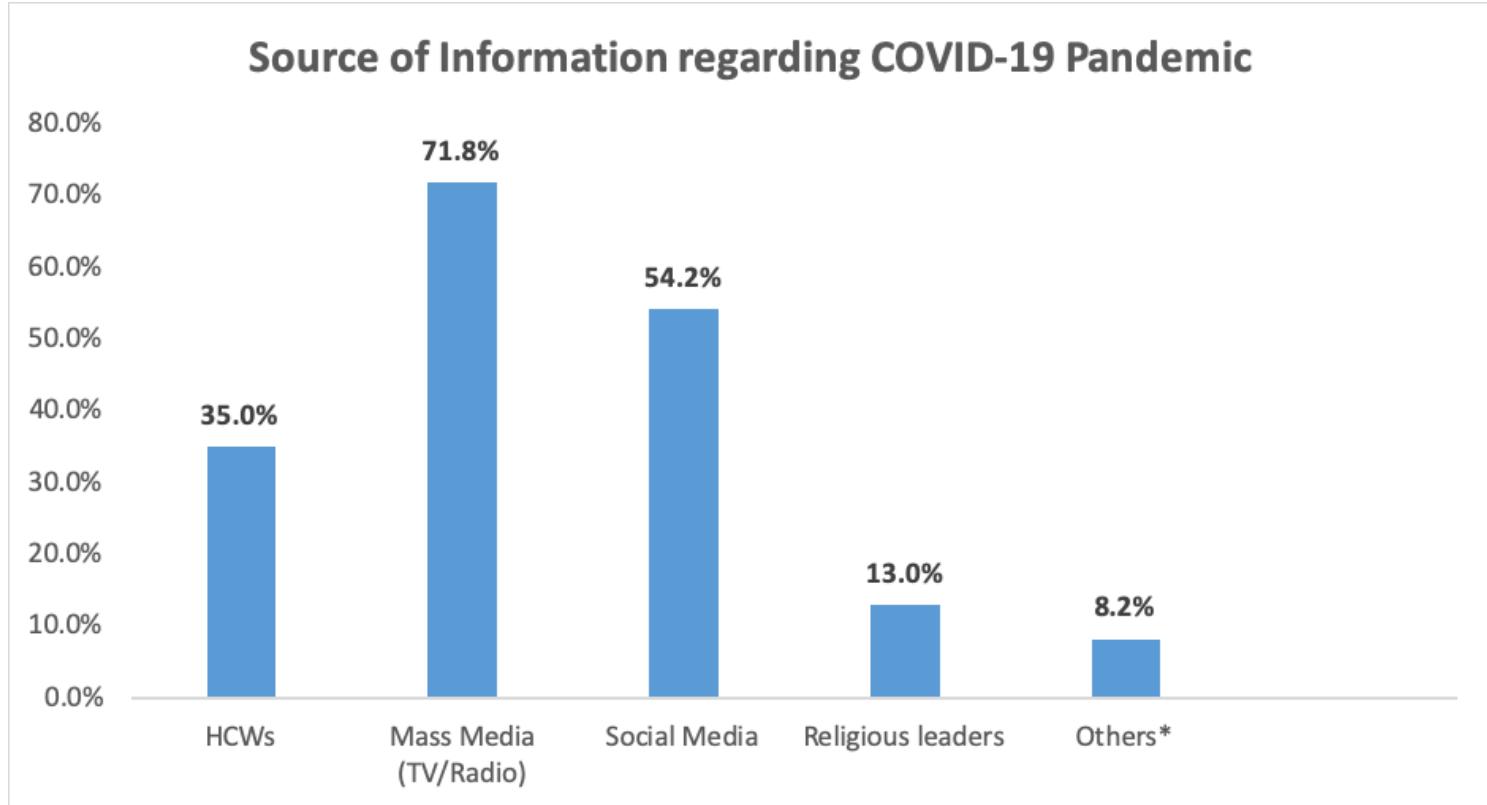


Figure 1

Source of information in which college students acquired information regarding COVID-19 pandemic, June 2020, Ethiopia.

COVID-19 Mode of Transmissions

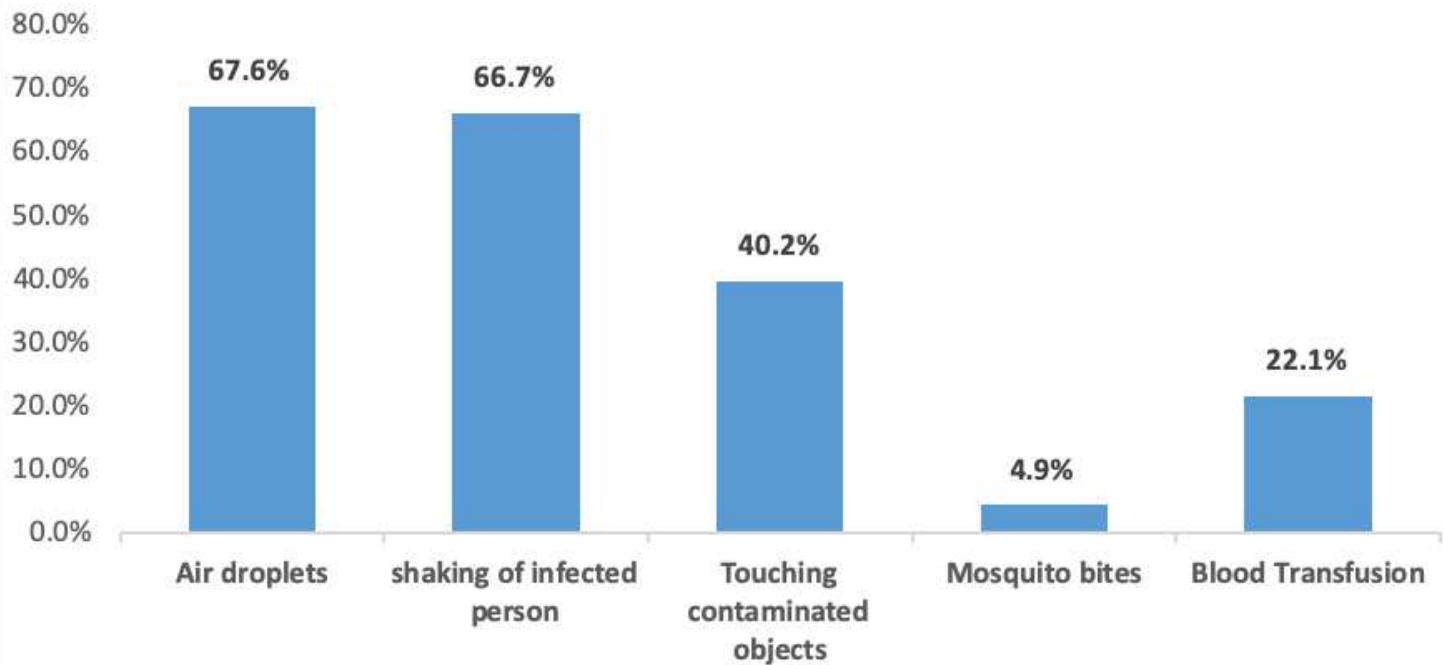


Figure 2

Students knowledge on the mode of transmission of COVID-19, June 2020, Ethiopia.

Signs and Symptoms of COVID-19

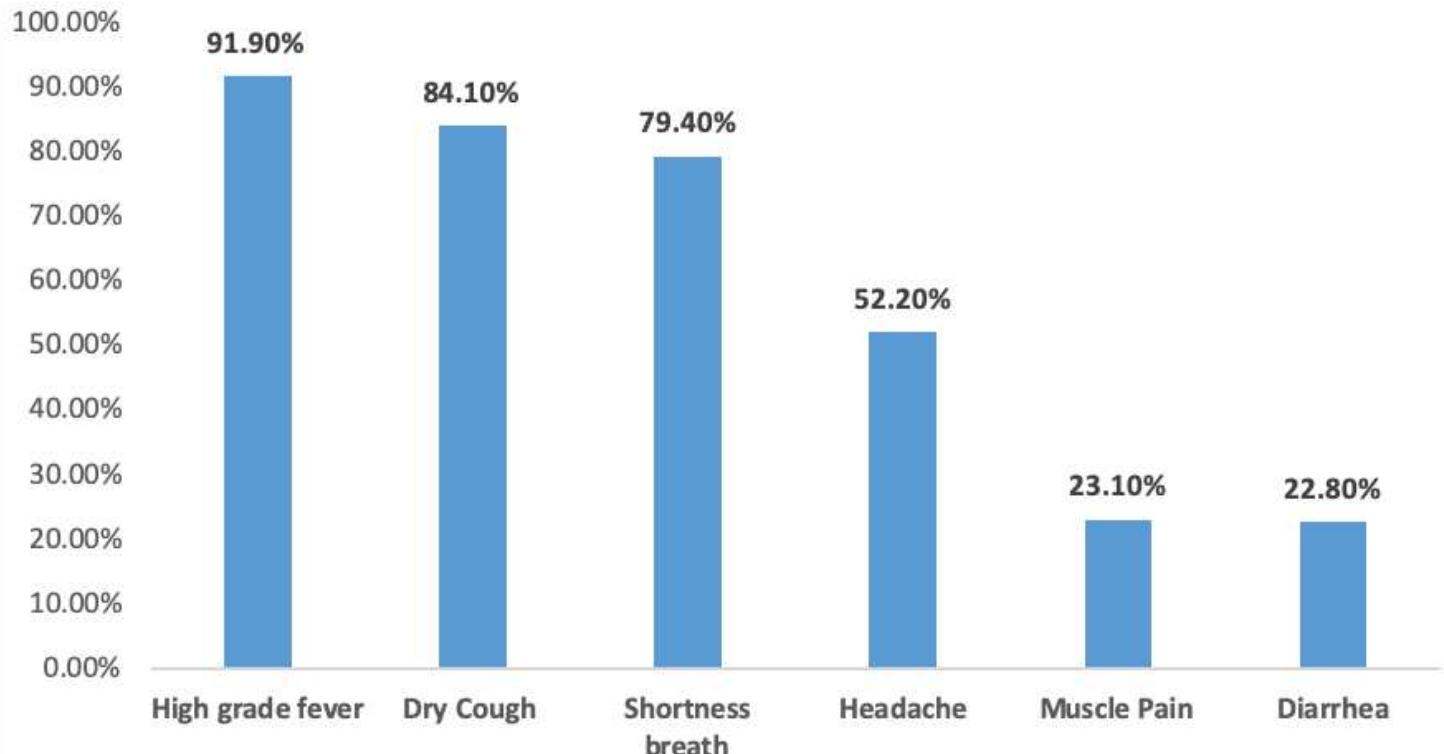


Figure 3

Students knowledge on the signs and symptoms of COVID-19, June 2020, Ethiopia.

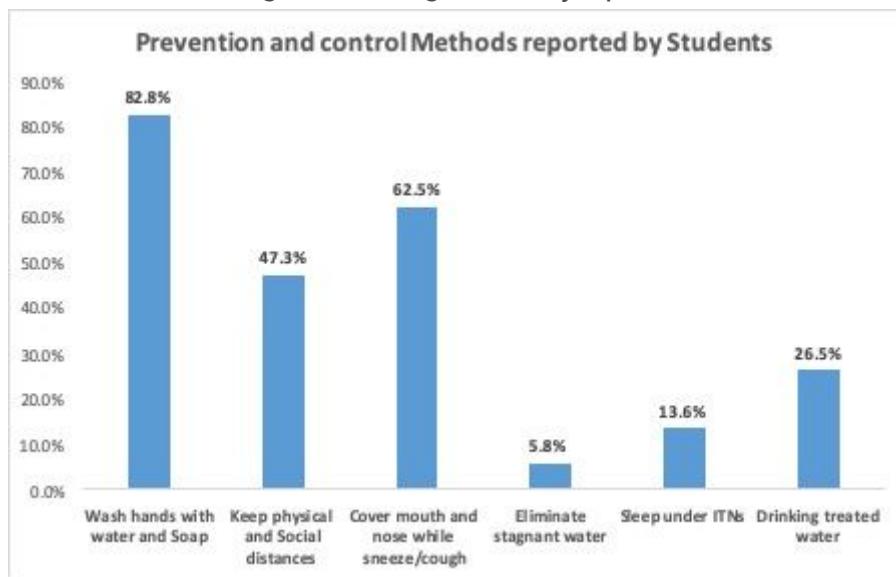


Figure 4

Students knowledge on the prevention and control modalities upon COVID-19.