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ORIGINAL RESEARCH

Knowledge, Attitudes, and Misconceptions About COVID-19 Prevention Practices Among High and Preparatory School Students in Dessie City, Ethiopia

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Background: Knowledge, attitudes, and misconceptions of students about COVID-19 (coronavirus disease) prevention have been examined in relatively few studies. This study aimed to assess the knowledge, attitudes and misconceptions about COVID-19 prevention practices among high and preparatory school (grades 9 to 12) students in Dessie City, Ethiopia.

Methods: This school-based cross-sectional study used a pre-tested structured questionnaire and direct observations from March 1 to 30, 2021 in 5 high and preparatory school students in Dessie City, Ethiopia. The sample size was proportionally allocated in each school based on the number of students registered in the first semester, stratified by grade level, and section. Data analysis employed 3 binary logistic regression models (Models I, II and III) with 95% CI (confidence interval). Bivariate analysis (crude odds ratio [COR]) and multivariable analysis (adjusted odds ratio [AOR]) were used. Variables with *P*-values <0.3 in the bivariate analysis were retained in the multivariable logistic regression analysis for each model. Variables with significance levels $P<0.05$ in the multivariable analysis of each model was identified as significant factors.

Results: The levels of good knowledge, positive attitudes, and low misconceptions were 74.8%, 60.2%, and 56.1%, respectively. After adjusting for the covariates, grade 12, positive attitude and living in households with more than 5 members were identified as factors significantly associated with good knowledge about COVID-19 prevention practices. Good knowledge of COVID-19 prevention practices, household size >5, infection prevention and control (IPC) training, and low level of misconceptions were factors significantly associated with positive attitudes, whereas students age ≥18 years, positive attitude, and IPC training were factors significantly associated with less misconceptions about COVID-19 prevention measures.

Conclusion: The prevalence of good knowledge, positive attitude, and low level of misconceptions of prevention practices for COVID-19 among students was relatively low. Therefore, Dessie City Health and Education Department and each high and preparatory school should implement continuous monitoring programs to ensure high prevention awareness and promote preventive behavior towards COVID-19.

Keywords: COVID-19, knowledge, attitudes, misconceptions, high and preparatory school, students, Dessie City, Ethiopia

Introduction

After more than 2 years into the COVID-19 (Coronavirus disease) pandemic, the world is still coping with its devastating impact. The transmission and spread of the coronavirus varies greatly among different communities, districts and countries with different socioeconomic, political, and infrastructural contexts.[1] The virus is transmitted through airborne and contact routes, manifests in a wide range of symptoms, and is resulting in the deaths of many people, especially old and immunologically compromised patients.[2]

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Developing countries bear the brunt of the COVID-19 pandemic. In Ethiopia, the government declared a state of emergency after the first case of COVID-19 was confirmed in March 2020. By March 10, 2022, a total of 469,134 confirmed cases and 7,484 deaths had been reported.[3] The increasing morbidity and mortality led to the closure of all educational institutions. While most other countries switched to online modes of teaching,[4] this was not feasible in Ethiopia, and the Ethiopian Ministry of Education decided after 6 months into the pandemic to re-open all education institutions and mandate the universally accepted COVID-19 prevention measures of social distancing, wearing masks, and practicing respiratory hygiene.[5] Little is known about knowledge, attitudes, and misconceptions about COVID-19 prevention measures among Ethiopian students, even though these factors are crucial in preventing and controlling COVID-19 and other acute viral diseases.[4–6]

Misconceptions about disease risk and prevention can facilitate the transmission of human diseases and good knowledge, perceptions, health behaviors and attitudes can facilitate their control[5,6] because all these factors influence health behavior.[7] During the COVID-19 pandemic, a number of misconceptions led to the creation of the webpage "*myth busters*" by WHO.[8]

Few studies have been carried out on knowledge, attitudes, and practices regarding of COVID-19 in schools in Ethiopia. Two studies were carried out among college students[5,9] and another one among preparatory students.[10] The latter study covered a 2-year age range of students, precluding an assessment of age in preventive behavior. Therefore, this study was designed to assess knowledge, attitudes, and misconceptions of COVID-19 prevention and control and associated factors among high and preparatory school students in Dessie City, Ethiopia.

Methods and Materials

Study Area and Study Design

This school-based cross-sectional study used an interviewer-administered questionnaire and direct observations from March 1 to 30, 2021 in 5 high and preparatory schools (students in grades 9-12) in Dessie City, Amhara Region, Ethiopia. The five high and preparatory schools (3 governmental and 2 private schools) in Dessie City Administration has accommodated a total of 9,024 students (4,341 males and 4,683 females) in March 2021.

Source Population and Exclusion Criteria

The source population included all students in grades 9 to 12 in Dessie City high and preparatory schools enrolled in March, 2021. Students who were absent during that study period were excluded from the study.

Sample Size Determination

The sample size for this study was calculated using a single population proportion formula.[11] We assumed 50.0% prevalence (p) of good knowledge, positive attitude and less misconception levels among high and preparatory school (grades 9–12) students in Dessie City due to the scarcity of other COVID-19 studies among high and preparatory school students in Ethiopia, 5.0% margin of error (d), 95.0% CI (confidence interval), and 10.0% non-response rate. Thus using the following formula:

$$[Z_1-_{\alpha/2}]^{2*}P[1-P]/d^2 = n$$

The initial sample size (n) became 384. Then, adjusting for the 10% non-response rate gave a final sample size (N) of 422 students.

Sampling Technique

The sample size in each of the 5 schools studied was determined based on the number of students registered in the first academic semester who attended school by March 2021. Each school was stratified by grade level and the samples were proportionally allocated to the 9th, 10th, 11th and 12th grades. The proportionally allocated samples in each grade level were further proportionally allocated to each section of the respective grade levels. Study participants were then selected

using simple random sampling (lottery method) based on classroom attendance at the time of the survey as the sampling frame.

Data Collection and Quality Assurance

The interviewer-administered, structured questionnaire was adapted from WHO COVID-19 guidelines and various reports.[12–16] The questionnaire includes selected socio-demographic, knowledge, attitude, and misconception variables. The data collectors were 3 BSc. in environmental health professionals and 3 BSc. holders in nursing. One data collector was recruited for each of the 4 schools and 2 data collectors for one school, which was the largest. The questionnaire was prepared in English and then translated to Amharic (the local language) and back to English by different translators to check its consistency. The principal investigator trained the data collectors for 2 days about the contents of data collection tool, data collection procedures and ethical issues. The questionnaire was pre-tested in 1 high and preparatory school in Kombolcha town with a 5% sample (21 students) to establish the validity and reliability of the questionnaire and the questionnaire was amended based on the findings of the pre-test.

Inter-observer reliability was ensured by providing clear definitions about knowledge, attitudes, misconceptions and prevention practices regarding COVD-19. The content validity of the questionnaire was improved by using a literature review to identify relevant items; the tool was evaluated by experts in the same research field and questions that were not relevant at the critical level were eliminated.

One supervisor and principal investigator supervised data collection and supported the data collectors. Each questionnaire was checked daily for completeness and consistency was checked before data were entered.

Outcome and Independent Variables

The outcome variables were knowledge (good or poor), attitudes (positive or negative), and misconceptions (less or more) about COVID-19 prevention practices. Explanatory variables were socio-demographic status and source of information on COVID-19.

Operational Definitions

Knowledge: Respondents scoring equal to or above the mean value 14.0 ± 6.2 (SD, standard deviations) were considered as having good knowledge about COVID-19 prevention practices and those scoring less than the mean value 14.0 ± 6.2 were considered as having poor knowledge of COVID-19 prevention practices.

Attitudes: Respondents who scored equal to or above the mean value 13.6 ± 7.5 were considered as having a positive attitude towards COVID-19 prevention practices whereas scores of less than the mean value 13.6 ± 7.5 were classified as negative attitude about COVID-19 prevention practices.

Misconceptions: Respondents scoring equal to or below the mean misconception value 6.3 ± 3.5 were classified as having less misconceptions, and scores of more than the mean value 6.3 ± 3.5 were classified as having more misconceptions about COVID-19 prevention measures.

Data Analysis

All data were entered to EpiData Version 4.6 and then exported to SPSS Version 25.0 for data cleaning and analysis. To assess the overall distribution, descriptive analysis was performed on categorical data and means with standard deviations were used on continuous variables.

Associations between independent factors and the outcomes of knowledge, attitudes, and misconceptions about COVID-19 prevention practices were determined independently using a binary logistic regression model with a 95% CI (confidence interval). We employed 3 distinct logistic regression models: The first model (Model 1) identified factors associated with good knowledge of COVID-19 prevention practices, the second model (Model II) identified factors associated with positive attitudes toward COVID-19 preventive measures, and the third model (Model III) identified factors associated with less misconception about COVID-19 preventive measures.

Bivariate analysis with crude odds ratio (COR) and multivariable analysis with adjusted odds ratio (AOR) were used for each model. Variables with *P*-values less than 0.3 in the bivariate analysis were entered into the multivariable logistic

regression analysis. Variables with significant levels of *p*–values less than 0.05 in the multivariable analysis of each model were identified as factors significantly associated with good knowledge, positive attitude, and less misperception toward COVID-19 prevention practices.

The occurrence of multicollinearity within independent variables was investigated using standard error at a cut-off value of 2 and a maximum standard error less than 2. The Hosmer-Lemeshow test[17] was used to assess model fitness for models I, II, and III, and the *p*-values were 0.897, 0.834, and 0.949, respectively, suggesting that all models fit.

Compliance with Ethical Standards

The Ethical Review Committee of the College of Medicine and Health Sciences of Wollo University gave ethical clearance for the study (Protocol number: WU/CMHS/146/03/2021). Official support letters were obtained from Wollo University for Dessie City Education Department in order to obtain support during data collection from each school. Prior to data collection, the purpose of the study was explained to each participant and informed written consent was obtained from study participants 18 years and older. For study participants below the age of 18 years, written consent was obtained from their families. Participants were informed that participation was voluntary and that they could decline to answer any of the questions during the interview and opt out of the study. They were also assured of the confidentiality of the information they provided. All study methods were performed in accordance with the ethical principles of the Declaration of Helsinki.

Results

Socio-Demographics Characteristics

Of the selected 422 students, 417 were included in the study (98.8% response rate). Two-thirds of the participants were females (256, 61.4%) and 60.9% were less than 18 years old. The mean (±SD) age of the students was 16.97 (±1.27) years. Almost all of the respondents (402, 96.4%) were single. Nearly half (204, 48.9%) of the participants' mothers were housewives and 141 (33.8%) of the fathers were government employees (Table 1). Nearly all (94.7%) participants received updated COVID-19 information from family/friends, television (90.4%), Facebook (89.2%), and other internet sources (90.6%) (Figure 1).

Knowledge of COVID-19 Prevention Practices

Three-fourths (74.8%, 95% CI: 70.3–78.9) of the students had good knowledge and 25.2% (95% CI: 21.1–29.5) had poor knowledge of COVID-19 prevention measures. The great majority (378, 90%) of the students knew that proper washing of hands for 20 seconds or more with soap and water can prevent the transmission of COVID-19 and 383 (90.8%) stated that rubbing hands with alcohol-based sanitizer can prevent transmission. The great majority of respondents (392, 94%) knew that maintaining a 2-meter social distance can protect against COVID-19 infection; 391 (93.8%) of them knew that face masks or face coverings can reduce the transmission of the virus (Table 2).

Attitudes About COVID-19 Prevention Practices

About 60.2% (95% CI: 55.6–65.2) of the students had a positive attitude and 39.8% (95% CI: 34.8–44.4) had a negative attitude towards COVID-19 prevention practices. Of the 351 students who thought COVID-19 can be controlled in Dessie, 335 (80.3%) stated that the virus can be controlled if people follow all guidelines of the Ministry of Health, and 215 (51.6%) stated that the administration of drugs can control the epidemic. Two-fifths (39.1%) of the students thought infections were socially stigmatized. Almost three-fifths (246, 59.0%) of the participants worried about contracting COVID-19 (Table 3).

Misconceptions of COVID-19 Prevention Measures

Most students (56.1%) (95% CI: 51.6–60.4) had relatively less misconceptions and 43.9% (95% CI: 39.6–48.4) had more misconceptions about COVID-19 prevention measures. More than four-fifths (84.2%) of the students were confident that

Table 1 Social-Demographic Characteristics and Sources of Information about COVID-19 among High and Preparatory School Students in Dessie City, Ethiopia, March 2021

Independent Variable		Frequency (*n*)	Percentage (%)
Age	<18 years	254	60.9
	≥18 years	163	39.1
Sex	Male	161	38.6
	Female	256	61.4
Religion	Orthodox Christian	230	55.2
	Muslim	172	41.2
	Protestant	15	3.6
Grade	9th	50	12.0
	10th	115	27.6
	11th	54	12.9
	12th	198	47.5
Marital status	Single	402	96.4
	Married	15	3.6
Mother's education status	Unable to read and write	16	3.8
	Able to read and write	22	5.3
	Primary	105	25.2
	Secondary	116	27.8
	College and above	158	37.9
Father's education status	Unable to read and write	18	4.3
	Able to read and write	26	6.2
	Primary	58	13.9
	Secondary	127	30.5
	College and above	186	44.6
Mother's occupation	Housewife	204	48.9
	Student	25	6.0
	Daily laborer	20	4.8
	Government employee	94	22.5
	Private employee	18	4.3
	Merchant	56	13.4

(*Continued*)

Table 1 (Continued).

Independent Variable		Frequency (*n*)	Percentage (%)
Father's occupation	Daily laborer	33	7.9
	Farmer	32	7.7
	Government employee	141	33.8
	Private employee	105	25.2
	Merchant	106	25.4
Household size (persons)	≤ 5	222	53.2
	>5	195	46.8
Did you obtain IPC training?	Yes	190	45.6
	No	227	54.4

the epidemic can be controlled in Dessie City. One fourths of the students (27.6%) considered eating garlic or *mitmita* (hot pepper) and frequently sipping water to prevent corona virus infection (Table 4).

Bivariate and Multivariable Analysis of Factors Associated with Knowledge About COVID-19 Prevention Practices

All variables with *P*-values < 0.3 in the bivariate analysis were entered into multivariable logistic regression analysis (Table 5). The final analysis showed that the odds of developing good knowledge about COVID-19 prevention practices among students in grades 11 and 12 were 5.45 times (AOR = 5.42, 95% CI: 2.55–11.67) higher than for lower-grade students. Similarly, the odds of developing good knowledge about COVID-19 prevention practices among students living in households with 5 or more members were 3.30 times (AOR = 3.30, 95% CI: 1.99–5.45) higher than for those who lived in smaller households. The odds of good knowledge among students who had a positive attitude were 2.69 times (AOR = 2.69, 95% CI: 1.63–4.44) higher than of those who had a negative attitude (Table 6).

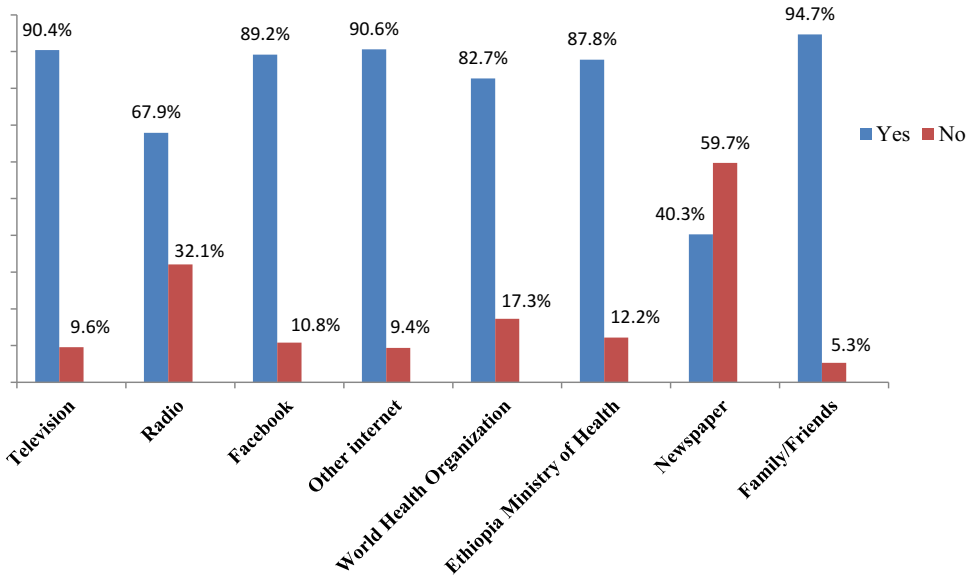

Figure 1 Source of Information about COVID-19 Prevention Measures among High and Preparatory School students in Dessie City, Ethiopia, March 2021.

Table 2 Knowledge of High and Preparatory School Students about COVID-19 Transmission and Prevention in Dessie City, Ethiopia, March 2021

Knowledge Question	Response	Frequency (*n*)	Percentage (%)
Is COVID-19 transmitted by air droplets between people?	Yes	263	63.1
	No	154	36.9
Is COVID-19 transmitted by physical contact?	Yes	172	41.2
	No	245	58.8
Is COVID-19 transmitted by evil spirits?	Yes	61	14.6
	No	356	85.4
Are all people at risk of COVID-19?	Yes	277	66.4
	No	140	33.6
Can the virus be transferred by shaking hands?	Yes	381	91.4
	No	36	8.6
Can touching your nose, mouth, eyes with un washed hands transfer the virus?	Yes	391	93.8
	No	26	6.2
Can proper washing of hands for at-least 20 seconds with soap and water prevent COVID-19?	Yes	378	90.6
	No	39	9.4
Can rubbing of hands with alcohol- based sanitizer prevent transmission of COVID-19	Yes	383	91.8
	No	34	8.2
Is there a need to wash hands before and after touching any surface using water and soap or sanitizer?	Yes	392	94.0
	No	25	6.0
Can sneezing or coughing into your arm/elbow prevent the spread of the virus?	Yes	394	94.5
	No	23	5.5
Can staying at home decrease the chance of getting infected?	Yes	386	92.6
	No	31	7.4
Can distancing 2 meters between people prevent the transmission of COVID-19?	Yes	392	94
	No	25	6
Does wearing a face mask decrease the risk of transmission of COVID-19?	Yes	391	93.8
	No	26	6.2
Can cloth masks be reused after washing with soap and water?	Yes	382	91.6
	No	35	8.4
Avoiding crowded places reduces the transmission of corona virus	Yes	381	91.4
	No	36	8.6
Does wearing gloves replace the need for hand washing or use of alcohol -based hand sanitizer?	Yes	349	83.7
	No	68	16.3
Can isolating oneself if getting sick prevent the spread of the virus?	Yes	389	93.3
	No	28	6.7

Table 3 Attitudes of High and Preparatory School Students towards COVID-19 Prevention Practices in Dessie City, Ethiopia, March 2021

Attitude Question	Response	Frequency (*n*)	Percentage (%)
Can the COVID-19 epidemic be controlled in Dessie?	Yes	351	84.2
	No	66	15.8
Do you think the epidemic can be controlled by people following all guidelines by the Ministry of Health?	Yes	335	80.3
	No	82	19.7
Do you think the epidemic can be controlled with drugs?	Yes	215	51.6
	No	202	48.4
Do you think the government should play a role in the prevention and control of COVID-19?	Yes	336	80.6
	No	81	19.4
Do you think the schools should play a central role in the prevention and control of COVID-19?	Yes	390	93.5
	No	27	6.5
Do you think each person should play a major role in the prevention and control of COVID-19?	Yes	294	70.5
	No	123	29.5
Do you think traditional medicine should be used in the prevention and control of COVID-19?	Yes	44	10.6
	No	373	89.4
Are prayers effective in preventing COVID-19?	Yes	312	74.8
	No	105	25.2
Do you think that you can contribute to preventing and controlling the COVID-19 epidemic?	Yes	368	88.2
	No	49	11.8
Do you believe that frequent hand washing damages skin and causes cracking, dryness, irritation and dermatitis?	Yes	212	50.8
	No	205	49.2
Do you believe you can protect yourself against COVID-19?	Yes	363	87.1
	No	54	12.9
Do you believe you have a very low risk of acquiring COVID-19 from others?	Yes	202	48.4
	No	215	51.6
Listening and following the direction of state and local authorities reduces COVID-19 transmission?	Yes	368	88.2
	No	49	11.6
Do you worry about contracting COVID-19?	Yes	246	59.0
	No	171	41.0
Do you think that the disease causes embarrassment or insult to infected persons or the relatives of students?	Yes	163	39.1
	No	254	60.9

Table 4 Misconceptions of High and Preparatory School Students About COVID- 19 Transmission and Prevention Practices in Dessie City, Ethiopia, March 2021

Misconception Question	Response	Frequency (*n*)	Percentage (%)
Is traditional medicine effective for COVID-19?	Yes	94	22.5
	No	323	77.5
Will this virus outbreak end soon?	Yes	96	23.0
	No	321	77.0
Can eating garlic and *mitmita* prevent corona virus infection?	Yes	115	27.6
	No	302	72.4
Are females more vulnerable to COVID-19 infection than males?	Yes	74	17.7
	No	343	82.3
Are only older adults and younger people at greater risk for COVID-19 infection?	Yes	74	17.7
	No	343	82.3
Do you have to be with someone for 10 minutes or more to catch the virus?	Yes	80	19.2
	No	337	80.8
Does rinsing the nose with saline protect against coronavirus?	Yes	64	15.3
	No	353	84.7
Does frequent sipping of water protect from corona infection?	Yes	94	22.5
	No	323	77.5
Will the coronavirus die off when temperatures rise in the spring?	Yes	133	31.9
	No	284	68.1
Is the coronavirus the deadliest virus known to man?	Yes	286	68.6
	No	131	31.4
Do flu and pneumonia vaccines protect against COVID-19?	Yes	89	21.3
	No	328	78.7
Can vitamin C cure COVID-19?	Yes	88	21.1
	No	329	78.9
Does gargling with warm salt water or vinegar eliminate the coronavirus?	Yes	83	19.9
	No	334	80.1

Bivariate Analysis of Factors Associated with Attitudes Towards COVID-19 Prevention Practices

Table 7 shows the results of the bivariate analysis of socio-demographic characteristics and source of information, knowledge, and misconceptions regarding COVID-19 with attitudes among high school and preparatory school students in Dessie City, Ethiopia, March 2021. The multivariable analysis showed that the odds of developing a positive attitude about COVID-19 prevention practices were 2.55 times higher (AOR = 2.55, 95% CI: 1.58–4.12) among students who had good knowledge about prevention programs than among those who had poor knowledge. The odds of developing a

Table 5 Bivariate Analysis of Knowledge of COVID-19 Associated with Socio-Demographic Characteristics, Sources of COVID-19 Information, Attitudes, and Misconceptions Among High and Preparatory School Students in Dessie City, Ethiopia, March 2021

Variable	Category	Knowledge		COR (95% CI)
		Good (*n*)	Poor (*n*)	
Age	<18	182	72	1
	≥18	130	33	1.56 (0.98–2.49)
Sex	Male	124	46	1
	Female	188	59	1.18 (0.76–1.85)
Religion	Orthodox Christian	176	53	1.51 (0.50–4.54)
	Muslim	125	47	1.21 (0.40–3.67)
	Protestant	11	5	1
Grade	9^{th}	31	19	1
	10^{th}	81	34	1.46 (0.73–2.93)
	11^{th}	28	26	0.66 (0.30–1.44)
	12^{th}	172	26	4.06 (2.01–8.20)
Marital status	Single	304	98	1
	Married	8	7	0.37 (0.13–1.04)
Mother's education status	Unable to read and write	9	7	1
	Able to read and write	15	7	1.67 (0.44–6.33)
	Primary	75	30	1.94 (0.66–5.70)
	Secondary	90	26	2.69 (0.91–7.93)
	College and above	123	35	2.73 (0.95–7.86)
Father's educational status	Unable to read and write	12	6	1
	Able to read and write	19	7	1.36 (0.37–5.02)
	Primary	46	12	1.92 (0.59–6.16)
	Secondary	96	31	1.55 (0.54–4.47)
	College and above	138	48	1.44 (0.51–4.04)
Mother's occupation	Housewife	152	52	1
	Student	14	11	0.44 (0.19–1.02)
	Daily laborer	13	7	0.64 (0.24–1.68)
	Government employee	71	24	0.99 (0.57–1.75)
	Private employee	12	5	0.89 (0.30–2.62)
	Merchant	50	6	2.85 (1.16–7.04)

(*Continued*)

Table 5 (Continued).

Variable	Category	Knowledge		COR (95% CI)
		Good (*n*)	Poor (*n*)	
Father's occupation	Daily laborer	28	5	1
	Farmer	21	11	0.34 (0.10–1.13)
	Government employee	102	39	0.47 (0.17–1.30)
	Private employee	84	21	0.71 (0.25–2.07)
	Merchant	77	29	0.47 (0.17–1.35)
Household size (persons)	≤5	97	63	1
	>5	215	42	3.33 (2.1–5.26)
Get updated information from television	Yes	280	97	1.39 (0.62–3.11)
	No	32	8	1
Get updated information from radio	Yes	212	71	0.99 (0.61–1.58)
	No	100	34	1
Get updated information from face book	Yes	248	83	0.97 (0.57–1.68)
	No	64	22	1
Get updated information from social media	Yes	271	85	0.64 (0.36–1.16)
	No	41	20	1
Get updated information from World Health Organization	Yes	260	85	0.85 (0.48–1.50)
	No	52	20	1
Get updated information from Ethiopia Ministry of Health	Yes	272	94	1.26 (0.62–2.55)
	No	40	11	1
Get updated information from newspaper	Yes	127	41	0.93 (0.59–1.47)
	No	185	64	1
Get updated information from families/friends	Yes	299	96	0.83 (0.38–1.79)
	No	13	9	1
Received IPC training	Yes	154	36	0.54 (0. 34–0. 85)
	No	158	69	1
Overall Attitudes	Positive	208	43	2.88 (1.83–4.54)
	Negative	104	62	1
Overall Misconceptions	Less	183	51	0.67 (0.43–1.04)
	More	129	54	1

Note: 1, reference category.

Table 6 Multivariable Analysis of Knowledge and Socio-Demographic Characteristics with COVID-19 Prevention Practices among High and Preparatory School Students in Dessie City, Ethiopia, March 2021

Variable	Category	COR (95% CI)	AOR (95% CI)	*p*-value
Grade	9th	1	1	
	10th	1.46 (0.73–2.93)	1.78 (0.84–3.76)	0.133
	11th	0.66 (0.30–1.44)	0.91 (0.39–2.12)	0.826
	12th	4.06 (2.01–8.20)	5.45 (2.55–11.67)	<0.001
Household size (persons)	≤5	1	1	
	>5	3.33 (2.1–5.26)	3.30 (1.99–5.45)	<0.001
Attitude	Positive	2.88 (1.83–4.54)	2.69 (1.63–4.44)	<0.001
	Negative	1	1	

Note: 1, reference category.

positive atitude about COVID-19 prevention practices among household size of greater than five were 1.56 times (AOR = 1.56, 95% CI: 1.02–2.39) higher compared to households size 5 or fewer members. The odds of developing a positive atitude about COVID-19 prevention practices among students who obtained infection prevention and control (IPC) training were 1.64 times (AOR = 1.64, 95% CI: 1.08–2.48) higher than those who had no training (Table 8).

Multivariable Analysis of Factors Associated with Misconceptions Regarding COVID-19 Prevention Practices

Table 9 shows the results of the bivariate of analysis of misconceptions and socio-demographic characteristics of grade 9–12 students regarding COVID-19 prevention practices in Dessie City, Ethiopia, March 2021. Students 18 years and older were 60% less likely to have low levels of misconceptions about COVID-19 prevention measures than their younger peers (AOR = 0.60, 95% CI: 0.40–0.90). Students who received IPC training were 67.0% less likely to have less misconceptions about COVID-19 prevention measures than those who had not received training (AOR = 0.67,95% CI:0.44–0.99). The odds of developing less misconceptions about COVID-19 prevnetion practices among students who had a positive attitude were 1.58 times (AOR = 1.58, 95% CI: 1.04–2.41) fewer than those who had a negative attitude (Table 10).

Discussion

The focus of this study was on determining the prevalence of knowledge, attitudes, and misconceptions and associated factors in regard to COVID-19 prevention practices among high and preparatory school students in Dessie City. We found tha the prevalence of good knowledge was 74.8% (95% CI: 70.3–79.1), positive atitude was 60.2% (95% CI: 55.6-65.2) and less misconceptions was 56.1% (95% CI: 51.6-60.4).

The rate of good knowledge in our study was lower than that reported by the only other COVID-19 study of preparatory students in Ethiopia,[18] which was also carried out in March 2021. This difference is consistent with the lower knowledge, attitude and misconception levels of the high school students in our study. Our findings reveal that the determinant factors for good knowledge were directly related to education level, household size, and positive attitude.

The prevalence of good knowledge of prevention measures (74.8%) in our study was similar to prevalence levels reported from studies in Saudi Arabia (68.1%)[4] and Bangladesh (61.2%)[19] as well as in Amhara Region (69.6%)[9] and Awi Zone (76.6%)[20] in Ethiopia. Variations may be the result of socio-demographic differences, the effectiveness of local COVID-19 programs, and the dates of the studies. Students in grades 11 and 12 in our study were 5.45 times more knowledgeable about COVID-19 than those in grades 9 and 10; this finding is similar to results from a study of students in 4 private and public universities in Amhara Region,[9] general populations in China[21] and Syria,[22] university students in Japan,[18] and health care workers in Bangladesh.[23]

Table 7 Bivariate Analysis of Socio-Demographic Characteristics and Source of Information, Knowledge, and Misconceptions on COVID-19 with Attitudes among High and Preparatory School Students in Dessie City, Ethiopia, March 2021

Variable	Category	Attitude		COR (95% CI)
		Positive (*n*)	Negative (*n*)	
Age	<18	153	101	1
	≥18	98	65	1.00 (0.67–1.49)
Sex	Male	106	64	1
	Female	145	102	0.86 (0.58–1.28)
	Orthodox Christian	129	100	0.77 (0.27–2.20)
	Muslim	112	60	1.12 (0.39–3.23)
	Protestant	10	6	1
Grade	9th	33	17	1
	10th	67	48	0.72 (0.36–1.44)
	11th	29	25	0.59 (0.27–1.32)
	12th	122	76	0.83 (0.43–1.59)
Marital status	Single	244	158	1
	Married	7	8	0.57 (0.20–1.59)
Mother's education status	Unable to read and write	8	8	1
	Able to read write	16	6	2.67 (0.69–10.36)
	Primary	61	44	1.39 (0.48–3.98)
	Secondary	75	41	1.83 (0.64–5.23)
	College and above	91	67	1.36 (0.49–3.80)
Father's education status	Unable to read and write	9	9	1
	Able to read and write	17	9	1.89 (0.55–6.45)
	Primary	36	22	1.64 (0.56–4.75)
	Secondary	78	49	1.59 (0.59–4.29)
	College and above	111	75	1.48 (0.56–3.90)
Mother's occupation	Housewife	127	77	1
	Student	16	9	1.01 (0.45–2.56)
	Daily laborer	10	10	0.61 (0.24–1.52)
	Government employee	52	43	0.72 (0.44–1.18)
	Private employee	9	8	0.76 (0.29–2.00)
	Merchant	37	19	1.18 (0.63–2.19)

(*Continued*)

Table 7 (Continued).

Variable	Category	Attitude		COR (95% CI)
		Positive (*n*)	Negative (*n*)	
Father's occupation	Daily laborer	22	11	1
	Farmer	17	15	0.57 (0.21–1.55)
	Government employee	76	65	0.59 (0.26–1.29)
	Private employee	63	42	0.75 (0.33–1.71)
	Merchant	73	33	1.11 (0.48–2.54)
Household size (persons)	≤5	81	79	1
	>5	170	87	1.91 (1.27–2.85)
Television as a source of information	Yes	230	147	0.71 (0.37–1.4)
	No	21	19	1
Radio as a source of information	Yes	165	118	1.28 (0.84–1.96)
	No	86	48	1
Facebook as a source of information	Yes	200	131	0.95 (0.59–1.55)
	No	51	35	1
Social media as a source of information	Yes	216	140	0.87 (0.50–1.51)
	No	35	26	1
World Health Organization as a source of information	Yes	212	133	0.74 (0.44–1.24)
	No	39	33	1
Ethiopia Ministry of Health as a source of information	Yes	218	148	1.25 (0.68–2.29)
	No	33	18	1
Newspaper as a source of information	Yes	98	70	1.14 (0.76–1.70)
	No	153	96	1
Families/friends as a source of information	Yes	230	152	1.00 (0.49–2.05)
	No	21	14	1
Received IPC training	Yes	128	62	1. 75 (1.17–2. 61)
	No	123	104	1
Overall Knowledge	Good	208	104	2.88 (1.83–4.54)
	Poor	43	62	1
Overall Misconceptions	Less	134	100	1.32 (0.89–1.97)
	More	117	66	1

Note: 1, reference category.

Table 8 Multivariable Analysis of Attitude and Socio-Demographic Characteristics among High and Preparatory School Students Towards COVID-19 Prevention Practices in Dessie City, Ethiopia, March 2021

Variable	Category	COR (95% CI)	AOR (95% CI)
Household size (persons)	>5	1.91 (1.27–2.85)	1.56 (1.02–2.39)
	≤5	1	1
Received IPC training	Yes	1. 75 (1.17–2. 61)	1.64 (1.08–2.48)
	No	1	1
Knowledge	Good	2.88 (1.83–4.54)	2.55 (1.58–4.12)
	Poor	1	1
Misconceptions	Less	1.32 (0.89–1.97)	0.64 (0.42–0.97)
	More	1	1

Note: 1, reference category.

Students who had a positive attitude had 2.74 times more knowledge than those with a negative attitude, corroborating a study in Nepal[24] and a study among health care workers in hospitals in Nigeria.[25] This study showed that students living with 5 or more family members had 3.30 times better knowledge of the COVID-19 pandemic than those living in smaller families. This finding differs from results of studies of college students in Amhara Region[9] and Debre Tabor Town in Ethiopia.[26]

The great majority (378, 90.6%) of participants knew that proper hand washing procedures (for at least 20 seconds with soap and water) can prevent COVID-19, a result similar to findings in studies in southwestern Ethiopia (92.7%),[27] South Wollo, Ethiopia (93.83%),[28] in Bangladesh (93.5%),[29] Egypt (94%),[30] and Nepal (97%),[31] but higher than in Addis Zemen Hospital, (78.5%),[32] Gondar City (53%)[33] and Amhara Region (79%,[34] all in Ethiopia. These discrepancies may be due to differences in the socio-demographic characteristics of the study populations and the effectiveness of national and local COVID-19 prevention programs.

In our study, 391 (93.8%) of the students knew that wearing a face mask decreases the risk of transmission of COVID-19. This rate was similar to those reported from southern Ethiopia (87.3%)[35] but higher than in South Wollo Zone (79.0%);[28] Addis Ababa (46.1%)[36] and Amhara Region (60%)[34] in Ethiopia, in Malaysia (76.7%),[37] Nigeria (86%),[38] Bangladesh (89.4%);[19] China (2.8%),[21] Philippines (49%[39] and India (36.5%).[40] These discrepancies may be due to variations in the effectiveness of prevention programs and socio-demographic characteristics of the study populations. Three fifths (60.2%, 95% CI: 55.5–64.5) of the participants had a positive attitude towards COVID-19 prevention measures.

Studies in 8 teaching hospitals in Ethiopia (94.7%);[41] among health care workers in Pakistan (86.5%),[42] among residents in Malaysia (86.5%),[37] in 10 universities in China (73.8%),[43] in Uganda (72.4%),[44] and in India (97.3%)[45] and in Bangladesh (78.9%)[19] reported higher rates. These rates are similar to those in Addis Ababa (60.7%)[36] but higher than in Pakistan (44%)[46] and Makerere University Teaching Hospital in Uganda (21%).[47] These discrepancies may be due to variations in study populations and the commencement dates and effectiveness of prevention programs.

In this study, the odds of having a positive attitude among students who had good knowledge about COVID-19 prevention measures were 2.69 times higher than for those with poor knowledge. Similar results were reported from Addis Ababa,[36] Sidama Region in southern Ethiopia[48] and Bangladesh.[19] The odds of having a positive attitude among students living in households larger than 5 persons were 1.56 times higher than among those in households smaller than 5 persons, a finding in line with a study in Gondar, Ethiopia.[49] Students in Dessie schools who received training about COVID-19 prevention measures had a 1.64 times higher positive attitude score than those who did not receive training, similar results in studies in South Gondar Zone hospitals.[50]

Table 9 Bivariate of Analysis of Misconceptions and Socio-Demographic Characteristics among High and Preparatory School Students Regarding COVID-19 Prevention Practices in Dessie City, Ethiopia, March 2021

Variable	Category	Misconception		COR (95% CI)
		Less (*n*)	More (*n*)	
Age	<18	129	125	1
	≥18	105	58	0.57 (0.38–0.85)
Sex	Male	88	82	1
	Female	146	101	0.74 (0.50–1.10)
Religion	Orthodox Christian	123	106	1.44 (0.51–4.08)
	Muslim	101	71	1.17 (0.41–3.37)
	Protestant	10	6	1
Grade	9	26	24	1
	10	65	50	0.83 (0.431.62)
	11	26	28	1.17 (0.54–2.52)
	12	117	81	0.75 (0.401.40)
Marital status	Single	224	178	1
	Married	10	5	0.63 (0.21–1.87)
Mother's educational status	Unable to read and write	10	6	1
	Able to read and write	11	11	1.67 (0.45–6.19)
	Primary	59	46	1.30 (0.44–3.84)
	Secondary	62	54	1.45 (0.504.26)
	College and above	92	66	1.20 (0.41–3.45)
Father's education status	Unable to read and write	7	11	1
	Able to read and write	14	12	2.27 (0.84–6.13)
	Primary	32	26	1.24 (0.54–2.83)
	Secondary	71	56	1.18 (0.65–2.13)
	College and above	110	76	1.14 (0.72–1.80)
Mother´s occupation	Housewife	115	89	1
	Student	14	11	1.02 (0.44–2.34)
	Daily laborer	11	9	1.06 (0.42–2.66)
	Government employee	50	44	1.14 (0.69–1.86)
	Private employee	13	5	0.49 (0.17–1.45)
	Merchant	31	25	1.04 (0.58–1.89)

(*Continued*)

Table 9 (Continued).

Variable	Category	Misconception		COR (95% CI)
		Less (*n*)	More (*n*)	
Father´s occupation	Daily laborer	14	19	1
	Farmer	15	17	0.84 (0.31–2.22)
	Government employee	81	60	0.55 (0.25–1.18)
	Private employee	67	38	0.42 (0.19–0.93)
	Merchant	57	49	0.63 (0.29–1.39)
Household size (persons)	≤5	85	75	0.82 (0.55–1.22)
	>5	149	108	1
Television as a source of information	Yes	211	166	0.94 (0.49–1.82)
	No	23	17	1
Radio as a source of information	Yes	158	125	0.97 (0.64–1.46)
	No	76	58	1
Facebook as a source of information	Yes	187	144	1.08 (0.67–1.74)
	No	47	39	1
Social media as a source of information (Wifi internet etc.)	Yes	203	153	1.28 (0.75–2.21)
	No	31	30	1
World Health Organization as a source of information	Yes	197	148	1.26 (0.76–2.10)
	No	37	35	1
Ethiopia Ministry of Health as a source of information	Yes	207	159	1.16 (0.64–2.08)
	No	27	24	1
Newspaper as a source of information	Yes	97	71	1.12 (0.75–1.66)
	No	137	112	1
Families/friends as a source of information	Yes	215	167	1.08 (0.54–2.17)
	No	19	16	1
Knowledge	Good	183	129	1.50 (0.43–4.04)
	Poor	51	54	1
Attitude	Positive	134	117	0.75 (0.89–1.97)
	Negative	100	66	1

The great majority (351, 84.2%) of participants believed COVID-19 can be controlled in Dessie City. Similarly high levels of confidence in the success of control programs were reported in Malaysia (95.9%),[37] Nigeria (85%),[38] Bangladesh (86.8%),[20] and the United Arab Emirates (89.0%)[51] but our levels were higher than in Iran (47.1%),[52] Syria (60.1%),[21] Tigray Region (74.3%),[53] and Ataye District Hospital in Ethiopia (7.2%).[54] These variations may be due to differences in the effectiveness of control programs and attitudes toward government programs.

Table 10 Factors Associated with Misconceptions Regarding COVID-19 Prevention Practices from Multivariable Analysis of Socioeconomic Status, Source of Information, Knowledge, and Attitude Among High and Preparatory School Students in Dessie City, Ethiopia, March 2021

Variable	Category	Misconception		COR (95% CI)	AOR (95% CI)
		Less (*n*)	More (*n*)		
Age	<18	129	125	1	1
	≥18	105	58	0.57 (0.38–0.85)	0.60 (0.40–0.90)
Received infection prevention and control (IPC) training	Yes	117	73	1.51 (1.02–2.23)	0.67 (0.44–0.99)
	No	117	110	1	1
Overall Attitude	Positive	134	117	0.75 (0.89–1.97)	1.58 (1.04–2.41)
	Negative	100	66	1	1

Note: 1, reference category.

More than half (246, 59.0%) of the students worried about contracting COVID-19, a figure similar to those in studies in Nepal (70.9%),[24] India (72%),[55] and Nigeria (56.37%).[56] More than half (234, 56.1%) (95% CI; 51.3–60.9%) of the students had less misconceptions about prevention measures of COVID-19 disease, this finding is similar to that from a study in Saudi Arabia (56.2%)[4] but lower than from a research in China (98%).[57] These discrepancies could be due to differences in data collection methods and socio-demographic characteristics of study populations and the effectiveness of prevention programs.

A small proportion (74, 17.7%) of the participants believed that females are more vulnerable to COVID-19 infection than males. This proportion was lower than in a study in Saudi Arabia (56.2%).[4] This study reveals that students who had a positive attitude about COVID-19 prevention and control measures had 1.56 times fewer misconceptions than those who had a negative attitude, corroborating results from a study in Saudi Arabia.[58]

Limitations of the Study

Due to the fear of being called uninformed, study participants may have provided socially acceptable answers to the knowledge and attitude questions. Another limitation is the cross-sectional study design, which did not allow assessment of the causality of the associations between knowledge, attitudes, misconceptions and preventive practices. We recommend longitudinal studies that examine the dynamics of knowledge and preventive behavior in the changing COVID-19 risk, intervention and socioeconomic environment in Ethiopia.

Another limitation is that our study was not a comparative study of the 2 groups of students (high school and preparatory school); differences in knowledge, attitudes and misconceptions between these 2 groups may be relevant in understanding age-linked and education-linked differences in COVID-19 prevention, as our study indicated, and thus may guide curriculum development.

Conclusion

The prevalence of good knowledge about COVID-19, positive attitudes, and less misconception towards preventive and control measures of COVID-19 among students in Dessie City were relatively low. After adjusting for covariates, we found positive attitude and large household size to be associated with good knowledge of COVID-19. Having good knowledge of COVID-19 prevention, living in large families, having IPC training, and having a low level of misconceptions were associated with a positive attitude. Similarly, age above 18 years, positive attitude, and IPC training were independent indicators of low misconception. Therefore, the Health and Education Department and each school in Dessie City should promote awareness and prevention practices in high schools and preparatory schools through appropriate health education programs, especially among younger students, to reduce misconceptions about and exposure risk to COVID-19.

Abbreviations

AOR, adjusted odds ratio; COR, crude odds ratio; COVID-19, coronavirus disease; IPC, infection prevention and control.

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Disclosure

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