Title: Inadequate level of knowledge, mixed outlook and poor adherence to COVID-19 prevention guideline among Ethiopians

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Abstract

COVID-19 has a potential to cause chaos in Ethiopia due to the country's already daunting economic and social challenges. Living and working conditions are highly conducive for transmission, as people live in crowded inter-generational households that often lack running water and other basic sanitary facilities. Thus, the aim of this study was to investigate the knowledge, attitudes and practices (KAP) of Ethiopians toward COVID-19 following the introduction of state of emergency by the Ethiopian government to curb the spread of the disease. A cross-sectional study design was conducted in nine reginal states and two chartered cities. Data for demographic, Knowledge, attitude and practice toward COVID-19 were collected through telephone interview from 1570 participants. Descriptive and bivariate analyses using chi-square test, t-test or analysis of variance were performed as appropriate. Binary and multiple logistic regression analysis were used to measure the relationship between the categorical dependent variables and one or more socio-demographic independent variables with two-tailed at α=0.05 significance level and 95% of confidence interval. The level of good knowledge, favourable attitude and good practice among the respondents were 42%, 53.8% and 24.3% respectively. Being rural resident, older than 50 years, having at least primary education, being resident of Amhara and Oromia regions were independent predictors of knowledge level. While being rural resident, married, employed, having at least basic education, being residents of Afar, Amhara, Gambela, Oromia and Somali regions were found

to be the best predictors of the attitude, being rural resident, government employee, having at least basic education, and living outside of the capital were the independent predictors of practice level of the respondents. The finding revealed that Ethiopians have inadequate level of knowledge and are generally have a mixed outlook on overcoming the pandemic with poor adherence to COVID-19 prevention practice. reinforcing preventive measures and intensifying sensitization campaigns to fill the knowledge gap and persuading people to follow the preventive measures set by the government with concurrent evaluation of the impacts of these measures on knowledge and practice is highly recommended to mitigate the disease.

1. Introduction

Coronavirus disease 2019 (COVID-19) is a pandemic disease caused by a novel human coronavirus (SARS-COV-2) first identified in china in December 2019 (1). The World Health Organization declared the outbreak of COVID-19 as a pandemic on the 11th of March 2020, after it has spread to 113 countries worldwide (2).

According to current evidence, the COVID-19 virus is primarily transmitted rapidly between people through respiratory droplets and contact routes (3). Airborne transmission has been suggested by some studies (4, 5). Recent experimental studies have examined the stability of SARS-CoV-2, showing that the virus remains infectious in aerosols for hours (5) and on surfaces up to days (5, 6). The mean incubation period of COVID-19 is about 3–9 days with a range between 0–24 days (3, 7). However, the mean time between successive cases in a chain of transmission is about 3-8 days suggesting that one becomes contagious before symptoms present about 2.5 days earlier from the onset of symptoms (8). Studies estimated that about 44% of transmission of COVID-19 occur before the onset of symptoms (9).

The first case of COVID-19 was confirmed in Ethiopia on 13th of March 2020 (10). The state of emergency was declared by the government on 8th of April 2020 to control the pandemic. The state of emergency includes closing schools, banning public gatherings and requiring employees to work from home (10). However, many political parties and scientists criticised the introduction of the state of emergency. Scientist criticised that the state of emergency did not consider stopping activities which likely to spread the virus such as the Ethiopian airlines which constantly flying elsewhere including to Chinese and European destination. While the federal and regional governments announced measures such as suspending large gatherings and inter-city public transport, authorities have not introduced a comprehensive lockdown to try to contain the virus. On the other hand, some opposition parties criticized that the

government is using COVID-19 state of emergency as a means to grab more power and consolidate tactical advantages ahead of future polls which was scheduled for 23rd of August 2020.

COVID-19 has the potential to cause chaos in Ethiopia due to the country's already daunting economic and social challenges. On one hand, the public health risks presented by COVID-19 are vast. Living and working conditions are highly conducive for transmission, as people live in crowded inter-generational households that often lack running water and other basic sanitary facilities. Allowing economic activity to continue unchecked could lead to huge infections within months, with serious cases quickly overwhelming the already weak health system (11).

Public health intervention measures are rapidly changing around the world to cope up with the rapid transmission of the disease and to minimize the risk for infection and speared of the disease. However, miscommunication regarding the threat of COVID-19 may lead to public confusion and inaction (12). Being older and having underlining health conditions, reduced ability to access and understand health information, inability to make well-informed decisions and failure to take optimal health-promoting are among the greatest risk factors for sever infection and death due to COVID-19 (12, 13). This situation is especially true when the health information itself is not timely, trusted, consistent, or actionable particularly in sub-Saharan African countries where health inequalities are worsened by lack of political commitment and good governance (14). As a result, a wide range of health disparities may exist by age, ethnicity, regions, political affiliations and socio-demographic status (14-16). Therefore, During COVID-19 pandemic when the understanding of critical preventive measures and ever-changing public health messages is most important, many vulnerable populations may be further marginalized by inadequate health communication, posing substantial risks to themselves and their communities.

82 On the other hand, the success of national preventive strategy of a pandemic is largely depends
83 on the adherence of the public to the preventive measures established by the government. The
84 public adherence is likely to be influenced by trust in government (17) and by public
85 knowledge and attitude toward the pandemic (18). By evaluating the public knowledge, attitude
86 and practice about COVID-19 pandemic, it is possible to explore attributes that influence the
87 public in adopting practices and responsive behaviour toward COVID-19 prevention measures.

88 Thus, the aim of study was to investigate the knowledge, attitudes and practices (KAP) of
89 Ethiopians toward COVID-19 following the introduction of state of emergency by the
90 Ethiopian government to help curb the spread of COVID-19 following 55 cases and 2 fatalities
91 on April 8, 2020 (19). we conducted a time sensitive KAP study in all regional states and
92 chartered cities of Ethiopia from May 20, 2020 to June 20, 2020.

2. Materials and methods

2.1. Study design and site

A cross-sectional study was conducted from May 20 to June 20, 2020 in nine regional states and two charted cities of Ethiopia. The regional statues include Tigray, Afar, Amhara, Oromia, Harari, Somali, Gambela, Benishangul and Southern Nations, Nationalities and Peoples' Region. (SNNP). The two charted cities are Addis Ababa (Finfinnee) and Dire Dawa.

2.2. Study population

The study population included all peoples living in the nine regional states and two chartered cities who are 18 years old and above during the study period.

2.3. Study procedure

This study was conducted after the government declared a state of emergency in the country to help curb the spread of COVID-19 following 55 cases and 2 fatalities on April 8, 2020. As face to face data collection was impossible, we opted to use telephone interview for enrolling potential participants. We ruled out the online enrolling methods for two reasons: Firstly, only about 17% of the population has access to the internet penetration but more than 45% of the population has access to either mobile network or fixed landline telephones in 2020 (20). Secondly, adult literacy is only 52% and social media penetration in Ethiopia is 5.5% by January 2020 (21). As a result, telephone interview was found to be the best alternative among the existing methods of data collection where face-to-face data collection is not possible.

2.4. Study tools

We adapted the survey tools from previous KAP studies towards COVID-19 (2, 12, 18). We included four core themes to assess the KAP of Ethiopians toward COVID-19. (i) demographic

115 data collection tools. (ii) knowledge about COVID-19, (iii) attitude toward COVID-19 and (iv)
116 practices appropriate to curb covid-19 infection and transmission.

117 **Demographic questions**: Each respondent was asked for age, gender, residence, occupation,
118 region, educational and marriage status.

119 **COVID-19 Knowledge**: Demonstrated knowledge of COVID-19 was assessed through asking
120 the respondents 10 close-ended questions. The questions include the respondents' knowledge
121 about the cause, transmission route, clinical symptoms, prevention and control measures of
122 COVID-19. Respondents were given three response options: 'true', 'false' or 'I do not now'.
123 A correct response was assigned 1 point, while an incorrect or I do not know response to the
124 question was assigned 0 points. Each respondent achieves between 0 and 10 score points.
125 Higher score indicates better knowledge of COVID-19 (supplementary (1).

126 **Attitude toward COVID-19:** To assess the attitude of respondents toward COVID-19, we
127 used 5 questions. Two questions include confidence of the respondent on COVID-19
128 prevention methods and confidence on the government to contain the spreading of coronavirus.
129 They were also asked if they are in favour of the state of emergency introduced to curb the
130 spread of COVID-19, their perception to get infected with coronavirus and if they believe
131 traditional herbs and religious faith can cure COVID-19. For each question a 4-point Likert
132 scale response options (strongly disagree, disagree, agree and straggly agree) were provided
133 (supplementary (1).

134 **Practice towards COVID-19 prevention:** To investigate how aften respondents' practice
135 COVID-19 prevention, 5-questions were used. The questions include how often the respondent
136 wash its hand with soap, avoid non-essential travel, keep 2-meter social distancing, avoid social
137 gatherings and avoid touching eyes, nose, and mouth with unwashed (unsensitized) hands. For

138 each question a 4-point Likert scale response options (never, sometimes, usually and always)
139 were provided.

140 ### 2.5. Data collection methods

141 Twenty data collectors were recruited and trained online. The data collectors were recruited
142 from each region. All data collectors had previous experience of KAP data collection by phone.
143 In most cases, phone numbers were randomly selected from local phone book. Following the
144 verbal consent, each respondent was assured that the voice is not recorded, and any personal
145 data is not required to participate in the study.

146 ### 2.6. Operational definitions

147 **Independent variables:** all sociodemographic variables: age, sex, education, marital status,
148 residence, employment and region are considered as independent variables.

149 **Dependent Variables:** knowledge, attitude and practice toward COVID-19 were considered
150 as dependent variables for all statistical analysis.

151 **Good level of knowledge:** Respondents who scored above the mean score of the total
152 respondents were considered as having good level of COVID-19 knowledge and those who
153 scored below the mean as having poor level of COVID-19 Knowledge.

154 **Favourable attitude**: A response of agree or strongly agree to attitude questions were
155 considered as favourable attitude for logistic regression analysis. However, for two questions:
156 "I believe that traditional herbs and faith such as holy water can cure COVID-19; and I do not
157 think I will get sick from COVID-19" a response of strongly disagree or disagree were
158 considered as favourable attitude.

Good practice: a response of "usually" and "always" to each practice question was considered as having good practice towards COVID-19 prevention.

2.7. Statistical analysis

Descriptive statistics (means with standard deviations and percentage frequencies) were calculated for all survey responses. Associations between socio-demographic characterises and responses to COVID-19 knowledge, attitude and practice were investigated in bivariate analyses using chi-square test, t-test or analysis of variance as appropriate. Binary and multiple logistic regression analyses were used to measure the relationship between the categorical dependent variables (knowledge, attitude and practice) and one or more socio-demographic independent variables. results of logistic regression have been reported as adjusted odds ratio (AOR). Data were analysed using Stata for Windows, version 16 (Stata Corp., College Station, TX, USA with two-tailed at $\alpha=0.05$ significance level and 95% of confidence interval

171 # 3. Result

172 ## 3.1. Social and demographic characteristics

173 A total of 1570 participants completed the survey questionnaire of which 896 (57.1%) of the
174 respondents were male. A third of the respondents were from rural residents. The age of the
175 respondents ranges from 18 and 73 years with a mean ± standard deviation (SD) of 31.6 year
176 ± 12.8. Among the respondents, 660 (42.0%) had college or university education while 260
177 (16.6%) are unable to read and write. Occupation-wise, about a third (34.9%) of them were
178 government employees while a fifth (19.5%) of them were self-employed and one in 6 (15.9%)
179 were farmers (Table 1).

Table 1. Sociodemographic characteristics of respondents (N=1570).

Demographic variable s		Number	Percentage (%)
Sex	male	896	57.1
	female	674	42.9
Residence	Urban	1094	69.7
	Rural	476	30.3
Ager group	18-29	860	54.8
	30-39	332	21.1
	40-49	174	11.1
	50-59	128	8.2
	60+	76	4.8
Marital status	single	662	42.2
	married	894	56.9
	widow	14	0.9
Education	illiterate	260	16.6
	basic	292	18.6
	primary	140	8.9
	secondary	218	13.9
	college/university	660	42.0
Occupation	farmer	250	15.9
	government employee	306	19.5
	self-employed	548	34.9
	student	466	29.7
Region/chartered city	Addis Ababa (Finfinnee)	326	20.8
	Afar	42	2.7
	Amhara	190	12.1
	Benishangual Gumuz	46	2.9
	Dire Dawa	52	3.3
	Harari	46	2.9
	Gambela	68	4.3
	Oromia	552	35.2
	Somali	60	3.8
	SNNPRS	90	5.7
	Tigray	98	6.2
	Total	1570	100.0

182 **3.2. COVID-19 Knowledge**

183 The overall correct response of the respondents to the knowledge questions about the COVID-
184 19 varies from 14.0% to 73.6% (Table 1) with the mean knowledge score of 4.2 (SD=2.809,
185 range 0-10) suggesting an overall of 42% (4.2/10*100) correct rate on COVID-19 knowledge
186 test. Knowledge scores significantly differ across each question. Nearly three-fourth (73.6%)
187 of the respondents have heard about COVID-19 but only 42.4% and 37.8% knew COVID-19
188 transmission and clinical manifestations, respectively. Only 14% of the respondents knew that
189 the asymptomatic transmission of COVID-19. While about 63.8% of the respondents had
190 correctly answered COVID-19 prevention methods such as handwashing, social distancing,
191 avoiding crowd gatherings and using face mask. only 18.6% of them knew that people who
192 have COVID-19 symptoms should self-isolate at least for 7 days and their household contacts
193 for 14 days. A third of the respondents consider that only elderly people or people with chronic
194 health conditions develop sever condition if infected with COVID-19. Nearly 80% of the
195 respondents did not know that currently there is no effective drug to cure COVID-19 nor
196 vaccines to prevent the infection (Table 2).

197 Table 2. Summary of respondents' response to COVID-19 knowledge questions (N=1570).

no	knowledge questions	Responses n (%).		
		Yes	No	I do not know
1	I have heard about Coronavirus (Covid-19) virus	1156 (73.6)	414 (26.4)	
2	Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus	414 (25.7)	136 (8.7)	1030 (65.6)
3	The main clinical symptoms of COVID-19 are fever, fatigue, continuous dry cough and shortness of breath	594 (37.8)	170 (10.8)	806 (51.3)
4	COVID-19 virus spreads primarily through droplets of saliva or discharge from the nose when an infected person coughs or sneezes	666 (42.4)	160 (10.2)	744 (47.4)
5	Only elderly people or people with chronic health condition develop sever condition if infected with COVID-19	454 (28.9)	458 (27.9)	678 (43.2)
6	Peoples infected with COVID-19 virus but not have any symptoms do not infect others	706 (45.0)	220 (14,0)	644 (41.0)
7	Children and young healthy adults do not necessarily take measures against COVID-19 as they are immune to the disease	450 (28.7)	436 (27.8)	684 (43.6)
8	Handwashing, social distancing, avoiding crowding and using facemask can reduce the risk of covid-19 infection	1002 (63.8)	154 (9.8)	414 (26.4)
9	People who have COVID-19 symptoms should self-isolate at least for 7 days and their household contacts for 14 days	292 (18.6)	222 (14.1)	1056 (67.3)
10	Currently there is no effective drug to cure COVID-19 nor vaccines to prevent infections	304 (19.4)	226 (14.4)	1040 (66.2)

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The student t-test has shown that the level of COVID-19 knowledge was low among female respondents compared to male respondents (P=0.05). Older respondent (≥50 years) had low COVID-19 knowledge than the other age group (F=8.38, P <0.0001). Similarly, there was a significant difference in the knowledge score of the respondents among age groups, residence, educational status, marital status and regions of residence (Table 3).

204 Table 3. Respondents knowledge score of COVID-19 by demographic variables (N-=1750).

Demographic variables		Number of participants (%)	Knowledge score (mean ± SD), (maximum score 10)	Statistical test (t or F)	Significance (P)
Sex	male	896(57.1)	4.641 ± 0.09706	2.12	0.0343*
	Female	674 (42.9)	4.338 ± 0.1021		
	Total	1570 (100.00)	1570 (100.00)		
Age in ears	18-29	860 (54.8)	4.73023 ±3.73023	8.38	< 0.0001*
	30-39	332 (21.1)	4.40964±3.17861		
	40-49	174 (11.1)	4.77011±3.1077		
	50-59	128 (8.2)	3.40625±2.75349		
	60+	76 (4.8)	3.73684±2.92743		
	Total	1570 (100.00)	1570 (100.00)		
Residence	urban	1094 (69.9)	4.724 ± 0.08727		< 0.0001*
	rural	476 (30.1)	4.000 ± 0.1163	4.73	
	Total	1570 (100.00)	1570 (100.00)		
Marital status	single	662 (42.2)	5.10876±2.48206		
	married	894 (56.9)	4.0962 ±2.95197	31.61	< 0.0001*
	widow	14 (0.9)	2.00±0.784465		
	Total	1570 (100.00)	1570 (100.00)		
Occupation	government employed	548 (34.9)	7.03268±2.85248		
	self-employed	306 (19.5)	3.37591±2.32645	230.00	< 0.0001*
	farmer	250 (15.9)	2.576±1.65868		
	student	466(29.7)	5.13008±2.30906		
	Total	1570 (100.00)	1570 (100.00)		
Educational level	illiterate	260 (16.6)	2.53077±1.53077	165.20	< 0.0001*
	basic	292(18.6)	2.93836 ±2.25283		

	primary	140(8.9)	4.31429 ±2.73818		
	secondary	218(13.9)	3.92661±2.11079		
	college/university	660(42.0)	6.18485 ±2.63035		
	Total	1570 (100.00)	1570 (100.00)		
Region/chartered city	Addis Ababa (Finfinnee)	326 (6.2)	6.42331±3.13765		
	Afar	42 (2.7)	4.61905±2.368	12.40	< 0.0001*
	Amhara	190 (12.1)	4.32632±2.99362		
	Benishangul Gumuz	46 (2.9)	4.3913±2.6955		
	Dire Dawa	52 (3.3)	5.11538±2.55645		
	Harari	46 (2.9)	4.65217±2.54049		
	Gambela	68 (4.3)	4.64706±2.35483		
	Oromia	552 (35.2)	3.66667±2.47626		
	Somali	60 (3.8)	4.66667±2.28975		
	SNNPRS	90 (5.7)	4.24444±2.82966		
	Tigray	98 (20.8)	5.97959±2.54031		
	Total	1570 (100.00)	1570 (100.00)		

*significant $p \leq 0.05$

After grouping respondents into good (mean score ≥ 4.2) and poor (mean score < 4.2) level of knowledge using a bloom's cut of points, binary and multivariable logistic regression was performed. Age, occupation, residence and education have been significantly associated with COVID-19 knowledge of the respondents with correct prediction of 72.2% in multivariable regression analysis. Multivariable logistic regression analysis has shown that respondents of age group 50-59 (AOR= 0.562; (95% CI: 0.4285-0.708) and above 59 years old (AOR=0.387; (95%CI: 0.1924-0.4982) were less knowledgeable about COVID-19 compared to respondents in the age group of 18-29. Similarly, respondents those who had college or university education had more than 14 times higher knowledge (AOR=14.026; (95%CI: 9.56431-21.8764) compared to those who are unable to read and write. Respondents from the two most populous regions, Amhara (AOR=0.497 (95%CI: 0.2990-0.6542) and Oromia (AOR= 0.4512; 95%CI: 0.3218-0.8026) regional states had poor level of knowledge compared with respondents from Addis Ababa (Finfinnee), the capital (Table 4).

219 Table 4. Logistic regression analysis of odds ratio for knowledge of the respondents in relation to COVID-19 potential risk factors.

4. Demographic variables		Univariable logistic regression			Multivariable logistic regression		
		Crude OR	95% CI	P-value	Adjusted OR	95% CI	P-value
Sex	Male	1.000			1		
	Female	0.921	0.747-1.135	0.440	0.864	0.7234-1.0923	0.621
Age in ears	18-29	1.000			1		
	30-39	0.829	0.637-1.080	0.165	0.923	0.6754-1.1073	0.243
	40-49	0.944	0.675-1.320	0.735	1.021	0.6891-1.4225	0.14
	50-59	0.473	0.307-0.728	0.001*	0.562	0.4285-0.708	0.004*
	60+	0.290	0.154-0.545	0.000*	0.387	0.1924-0.4982	0.001*
Residence	Urban	1.000					
	Rural	0.682	0.541-0.860	0.001*	0.772	0.5640-0.9245	0.004*
	Single	1.000					
Marital status	Married	0.524	0.425-0.646	0.000*	1.023	0.8776-1.2113	0.061
	Widow	0.000	0.621-1.135	0.998	0.8823	0.7645-0.9921	0.12
	Farmer	1.000					
Occupation	Government Employee	20.599	12.681-33.461	0.000*	16.4321	11.4564-27.9687	0.001*
	Self-employed	2.206	1.376-3.536	0.001*	1.76	1.0248-2.6843	0.008*
	Student	8.716	5.512-13.784	0.000*	5.0264	3.0245-10.2318	0.001*
Education	Illiterate	1.000					
	Basic	2.023	1.181-3.466	0.000*	1.276	0.9876-2.1346	0.086
	Primary	4.327	2.447-7.654	0.000*	3.0341	1.9842-5.6742	0.02*
	Secondary	3.740	2.197-6.366	0.000*	3.042	2.4420-6.2143	0.012*
	college/university	16.434	10.335-26.130	0.000*	14.026	9.56431-21.8764	0.001*

Region/chartered city	Addis Ababa (Finfinnee)	1.000					
	Afar	0.745	0.569-1.102	0.091	0.703	0.5423-1.097	0.110
	Amhara	0.513	0.349-0.756	0.001*	0.497	0.2990-0.6542	0.007*
	Benishangual Gumuz	0.596	0.302-1.259	0.127	0.586	0.2882-0.7549	0.340
	Dire Dawa	0.999	0.552-1.807	0.997	0.992	0.5286-1.577	0.481
	Harari	0.696	0.306-1.159	0.427	0.621	0.2764-1.112	0.67
	Gambela	0.743	0.431-1.280	0.284	0.709	0.476-1.1187	0.41
	Oromia	0.470	0.305-0.889	0.000*	0.4512	0.3218-0.8026	0.001*
	Somali	0.908	0.518-1.592	0.737	0.9	0.6234-1.4410	0.820
	SNNPRS	0.553	0.334-0.918	0.022*	0.54	0.3491-0.8823	0.230
	Tigray	1.672	1.061-2.634	0.027	1.02	0.7465-3.2438	0.160

220 OD= odds ratio; CI= confidence interval; * significant at P≤0.05

3.3. Attitude

Five questions were used to measure the attitude of the respondents towards COVID-19. More than 50% of the respondents either agree or strongly agree that traditional herbs and religious faith such as holy water can cure COVID-19. Half of the respondents think that it is unlikely to get sick from COVID-19. About 47% of the respondents do not agree with the principles of COVID-19 prevention methods such as hand washing, social distancing, avoiding non-essential travel and self-isolation (if have symptoms) and 57.1% of them disagree with the current introduction of state emergency to curb the spread of COVID-19. Only 40.4% of the respondents are confident that the government can prevent a nationwide outbreak of the disease (Table 5).

The association between the socio-demographic variables and COVID-19 attitude was assessed by chi-square test (Table 5). The overall favourable attitude response rate was 43.8%. Respondents in the age group of 40-49 years had more favourable attitude (50.6%) towards COVID-19 prevention methods and principles than the other age groups (χ^2=8.6, $P \leq 0.05$). Interestingly rural residents had more favourable attitude (59.2%) than the corresponding urban residents (37.1%) (χ^2 =65.996, $P \leq 0.001$). There was strong association between occupation and attitude towards COVID-19 (χ^2 = 335.735, $P \leq 0.0001$). While government employees had the highest favourable response (77.8%), self-employed respondents had the least favourable response rate (15.7%). The educational status of the respondents was also found to be strongly associated with the attitude of the respondents towards COVID-19 (χ^2=195.914, $P \leq 0.001$). Respondents from Tigray (65.3%) and Amhara (63.2%) regions had relatively higher favourable attitude while respondents from Gambela (17.6%) and Afar (28.6%) had the lowest favourable attitude (χ^2 =89.64, $P \leq 0.001$) (Table 6).

244 Table 5. Summary of respondents' response to COVID-19 attitude questions (N=1570).

no	Attitude questions	Response n (%); N= 1570			
		Strongly disagree	Disagree	Agree	Strongly agree
1	I believe that traditional herbs and religious faith such as Holy water can cure COVID-19	588 (37.5)	186 (11.8)	290 (18.5)	506 (32.2)
2	I am in favour of state of emergency introduced to control the spread of the coronavirus	678 (43.2)	220 (14.0)	328 (20.9)	344 (21.9)
3	I don't think that I will get sick from the coronavirus	490 (31.2)	322(20.5)	286(18.2)	472 (30.1)
4	I am confident that the government can prevent a nationwide outbreak of the coronavirus	598 (38.1)	388 (21.5)	232 (14.8)	402 (25.6)
5	Hand washing, social distancing, avoiding non-essential travel and self-isolation (if have symptoms) greatly help to contain the spreading of coronavirus	386 (24.6)	356 (22.7)	262 (16.7)	566 (36.1)

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247 Table 6. Respondents attitude score of COVID-19 by demographic variables (N-=1570).

Demographic variables		Attitude response n (%)		Statistical test	p (two-sided)
		unfavourable	favourable	χ^2	
Sex	male	502 (56.0)	394 (44.0)	0.02	0.889
	Female	380 (56.4)	294 (43.6)		
Age in ears	18-29	478 (55.6)	382 (44.4)	8.60	0.072
	30-39	188 (56.6)	144 (43.4)		
	40-49	86 (49.4)	88 (50.60)		
	50-59	84 (65.6)	44 (34.4)		
	60+	46 (60.5)	30 (39.5)		
Residence	urban	688 (62.9)	406 (37.1)	65.996	0.000
	rural	194 (40.8)	282 (59.2)		
Marital status	single	332 (50.2)	330 (49.8)	20.54	0.000
	married	538 (60.2)	356 (39.8)		
	widow	12 (85.7)	2 (14.3)		
Occupation	government employee	68 (22.2)	238 (77.8)	335.735	0.000
	self-employed	462 (84.3)	86 (15.7)		
	farmer	114 (45.6)	136 (54.4)		
	student	238 (51.1)	228 (48.9)		
Education	illiterate	194 (74.6)	66 (25.4)	195.914	0.000
	basic	220 (75.3)	72 (24.7)		
	primary	72 (51.4)	68 (48.6)		
	secondary	152 (69.7)	66 (30.3)		
	college/university	244 (37.0)	416 (63.0)		
Region/chartered city	Addis Ababa (Finfinnee)	180 (55.2)	146 (44.8)	89.64	0.000
	Afar	30 (71.4)	12 (28.6)		

	Amhara	70 (36.8)	120 (63.2)		
	Benishangual Gumuz	24 (52.2)	22 (47.8)		
	Dire Dawa	24 (46.2)	28 (53.8)		
	Harari	24 (52.2)	22 (47.9)		
	Gambela	56 (82.4)	12 (17.6)		
	Oromia	346 (62.7)	206 (37.3)		
	Somali	44 (73.3)	16 (26.7)		
	SNNPRS	50 (55.6)	40 (44.4)		
	Tigray	34 (34.7)	64 (65.3)		
	overall	882 (56.2)	688 (43.8)		

248

Multivariable regression analysis has shown that residence, marital status, education, occupation and age are factors that most predict the attitude of the respondents with the correct predication of 73.2%. The odds of favourable attitude for being rural resident is twice as high as being urban resident (AOR=1.909; 95%CI: 1.436-2.538). On the other hand, being married (AOR=0.58; 95%CI: 0.398-0.854) and widow (AOR= 0.17; 95% CI: 0.034-0.854) were less likely to have favourable attitude compared to unmarried (single) respondents. Government employees had the highest odds of favourable attitude (OR=4.8) compared to farmers. As the educational level of the respondents increases, the odds of favourable attitude increase (OR=1.41, 1.68 and 3.01) for primary, secondary and college/university education respectively). While, Odds of favourable attitude for respondents from Amhara region is twice the odds of favourable attitude of respondents from Addis Ababa. The odds of favourable attitude of respondents from Afar, Gambela, Somali and Oromia are significantly low ($P \leq 0.05$) (Table 7).

262 Table 7. Logistic regression analysis of odds ratio for attitude of the respondents in relation to COVID-19 potential risk factors.

Demographic variables		Favourable attitude towards Covid-19 prevention measures					
		Univariable binary logistic regression			multivariable logistic regression		
		Crude OR	95% CI	P-value	adjusted OR	95% CI	P-value
Sex	male	1.00					
	Female	1.04	0.83-1.24	0.889	0.908	0.712-1.157	0.436
Age in ears	18-29	1.00					
	30-39	0.96	0.958-1.237	0.745	0.87	0.623-1.234	0.531
	40-49	1.28	0.924-1.774	0.138	1.03	0.7834-2.292	0.643
	50-59	0.66	0.444-0.967	0.033*	0.72	0.548-1.009	0.090
	60+	0.82	0.505-1.318	0.406	0.89	0.728-1.233	0.620
Residence	Urban	1.00					
	Rural	2.46	1.977-3.070	0.000*	1.909	1.436-2.538	0.000*
Marital status	Single	1.00					
	Married	0.61	0.435-0.855	0.00*	0.583	0.398-0.854	0.000*
	Widow	0.39	0.078-1.954	0.25	0.172	0.034-0.854	0.006*
Occupation	Farmer	1.00					
	Government employee	2.79	1.926-4.031	0.000*	4.758	2.144-7.321	0.000*
	Self employed	0.15	0.106-0.211	0.000*	0.559	0.423-0.992	0.042*
	Student	0.53	0.351-0.808	0.003*	0.852	0.582-1.113	0.110
Education	Illiterate	1.00					
	Basic	0.96	0.654-1.415	0.844	0.88	0.6783-1.194	0.740
	Primary	2.78	1.800-4.282	0.000*	1.41	1.09-3.247	0.023*
	Secondary	1.28	0.854-1.908	0.234	1.68	1.420-2.228	0.040*
	College/university	5.01	3.636-6.908	0.000*	3.01	2.078-5.193	0.000*

Region/chartered city	Addis Ababa (Finfinnee)	1.00			1		
	Afar	0.49	0.244-0.997	0.049*	0.52	0.242-0.8812	0.024*
	Amhara	2.11	1.465-3.050	0.000*	1.876	1.0429-3.378	0.036*
	Benishangual Gumuz	1.13	0.609-2.097	0.698	0.597	0.267-1.332	0.208
	Dire Dawa	1.44	0.799-2.588	0.225	0.841	0.499-1.416	0.514
	Harari	1.14	0.719-2.897	0.698	0.820	0.371-1.812	0.624
	Gambela	0.26	0.136-0.0511	0.000*	0.259	0.113-0.595	0.001*
	Oromia	0.73	0.556-0.969	0.029*	0.537	0.325-0.888	0.015*
	Somali	0.45	0.243-0.827	0.010*	0.245	0.112-0.535	0.000*
	SNNPRS	0.99	0.617-1.577	0.954	0.702	0.368-1.374	0.302
	Tigray	2.32	1.451-3.712	0.000*	1.016	0.473-2.181	0.968

264 ### 3.4. Practice

265 The practice of the respondents to prevent COVI-19 was assessed by 5 questions. About 43%
266 of the respondents never practice any of the COVID-19 prevention methods and only less than
267 one fifth (19.1%) of the respondents follow COVID-19 prevention measures either usually or
268 always. About a third (31.0%) of respondents never wash their hands with soap and 42.9% of
269 the respondents never avoided touching their eyes, nose, and mouth with their unwashed or
270 unsensitized hand. Four of five respondents (81.4%) do not keep 2-meter social distancing
271 whenever they are out for essential reasons. More than half of the respondents never avoided
272 social gatherings for religious, festivals, or other ceremonies since the introduction of the state
273 of emergency (Table 8).

Table 8. Summary of respondents' response to COVID-19 practice questions (N=1570).

no	Practice questions	response n (%); N= 1570			
		never	sometimes	usually	always
1	I wash my hands with soap frequently	486 (31.0)	630 (40.1)	344 (21.9)	110 (7.0)
2	I avoided non-essential travel since the lockdown	682 (43.4)	598 (38.1)	214 (13.6)	76 (4.8)
3	I always keep the social distancing of at least 2-meters whenever I am out for essential reasons	710 (45.2)	568 (36.2)	228 (14.5)	64 (4.1)
4	I avoided social gatherings for religious, festivals, or other ceremonies since the state emergency is introduced	810 (51.6)	508(32.4)	190 (12.1)	62 (3.9)
5	I avoid touching my eyes, nose, and mouth with my unwashed hands.	678 (43.2)	686 (43.7)	160 (10.2)	46 (2,9)
	Overall	673 (42.9)	598 (38.1)	227 (14.5)	72 (4.6)

There was no statistically significant difference between gender, and among age and marital status in the implementation of COVID-19 preventive measures at individual level. On the other hand, there is statistically significant difference in practicing COVID-19 preventive measure among residence, education, occupation and region of the respondents ($P \leq 0.001$). While 27.6% of urban respondents practice COVID-19 prevention measures, only 16.8% of the corresponding rural residents practice these measures either usually or always. Only a small proportion of respondents practice COVID-19 prevention measures in SNNP, Gambela and Dire Dawa compared to respondents from other regions (Table 9).

284 Table 9. Respondents practice score of COVID-19 by demographic variables (N-=1570).

Demographic variables		Response n (%)		Statistical test	P (two-sided)
		Never/sometimes	Usually/always	χ^2	
Sex	Male	663 (74.0)	233(26.0)	3.174	0.085
	Female	525 (77.9)	149(22.1)		
Age in ears	18-29	652 (75.8)	208 (24.2)	0.452	0.978
	30-39	249 (75.0)	83 (25.0)		
	40-49	132 (75.9)	42 (24.1)		
	50-59	99 (77.3)	29 (22.7)		
	60+	56 (73.7)	20 (26.3)		
Residence					
	Urban	792 (72.4)	**302 (27.6)**	**21.007**	**0.000**
	Rural	396 (83.2)	80 (16.8)		
Marital status	Single	486 (73.4)	176 (26.6)	3.429	0.180
	Married	692 (77.4)	202 (22.6)		
	Widow	10 (71.4)	4 (28.6)		
Occupation	Government employee	186 (60.8)	120 (39.2)	57.476	0. 000
	Self-employed	423 (77.2)	125 (22.8)		
	Farmer	219 (87.6)	31 (12.4)		
	Student	360 (77.3)	106 (22.7)		
Education	Illiterate	213 (81.9)	17 (18.1)	3.056	0.000
	Basic	240 (82.2)	52 (17.8)		
	Primary	114 (81.4)	26 (18.6)		
	Secondary	166 (76.1)	52 (23.9)		

	College/university	455 (68.9)	205 (31.1)		
Region/chartered city	Addis Ababa (Finfinnee)	185 (56.7)	141 (43.3)	95.236	0.000
	Afar	36 (85.7)	6 (14.3)		
	Amhara	155 (81.6)	35 (18.4)		
	Benishangual Gumuz	36 (78.3)	10 (21.7)		
	Dire Dawa	46 (88.5)	6 (11.5)		
	Harari	39 (84.8)	7 (15.2)		
	Gambela	60 (88.2)	8 (11.8)		
	Oromia	434 (78.6)	118 (21.4)		
	Somali	48 (80.0)	2 (20.0)		
	SNNPRS	80 (88.9)	10 (11.1)		
	Tigray	69 (70.4)	29 (29.6)		
	Overall	1188 (75.7)	382 (24.3)		

286 Multivariable logistic regression analysis has shown that residence, region, education and
287 occupation are the most predicting factors (76.1%) of COVID-19 appropriate practical
288 measures. Being rural resident has a probability of 43.0% not to practice COVID-19
289 prevention measures than being urban resident. The odds of government employee are more
290 than twice (AOD=2.268) compared with the odds of being farmer towards appropriate COVID-
291 19 practical measures while the odds of being self-employed was not statistically significantly
292 different compared with the odds of being a farmer. The odds of respondents from all other
293 regions were significantly lower than the odds of Addis Ababa (Finfinnee) respondents (Table
294 10).

295 Table 10. Logistic regression analysis of odds ratio for practice of the respondents in relation to COVID-19 potential risk factors.

Demographic variables		Good practice towards Covid-19 prevention					
		Univariable binary logistic regression			multivariable logistic regression		
		Crude OR	95% CI	P-value	adjusted OR	95% CI	P-value
Sex	male	1			1		
	Female	0.808	0.638-1.022	0.075	0.852	0.661-1.099	0.218
Age in ears	18-29	1			1		
	30-39	1.045	0.779-1.401	0.769	1.860	1.003-3.447	0.049
	40-49	0.997	0.682-1.459	0.989	1.587	0.861-2.995	0.139
	50-59	0.918	0.590-1.429	0.705	1.643	0.858-3.146	0.134
	60+	1.120	0.656-1.909	0.679	1.344	0.683-2.645	0.391
Residence	urban	1			1		
	rural	0.530	0.403-0.697	0.000*	0.570	0.413-0.786	0.001*
Marital status	single	1			1		
	married	.806	0.639-1.018	.070	1.224	0.342-4.383	0.757
	widow	1.105	0.342-3.567	.868	1.700	0.496-5.821	0.398
Occupation	farmer	1					
	government employee	4.558	2.934-7.081	0.000*	2.268	1.519-3.385	0.000*
	Self-employed	2.088	1.364-3.196	0.001*	1.102	0.584-2.081	0.765
	student	2.080	1.348-3.211	0.001*	1.372	0.875-2.151	0.168
Education	illiterate	1.000					
	basic	0.982	0.635-1.518	0.935	2.093	1.3923-3.146	0.000*
	primary	1.034	0.608-1.757	0.903	2.283	1.561-3.338	0.000*
	secondary	1.420	0.911-2.212	0.122	2.343	1.461-3.758	0.000*
	college/university	2.042	1,430-2.916	0.000*	1.494	1.036-2.153	0.031*
Region/chartered	Addis Ababa (Finfinnee)	1			1		

city	Afar	0.2187	0.090-0.533	0.001*	0.559	0.337-0.928	0.025*
	Amhara	0.2963	0.193-0.454	0.000*	0.236	0.095-0.585	0.002*
	Benishangual Gumuz	0.364	0.175-0.759	0.007*	0.367	0.234-0.573	0.000*
	Dire Dawa	0.1710	0.071-0.412	0.000*	0.519	0.371-0.727	0.000*
	Harari	0.235	0.102-0.452	0.001*	0.250	0.108-0.582	0.001*
	Gambela	0.175	0.081-0.378	0.000*	0.211	0.103-0.431	0.000*
	Oromia	0.357	0.265-0.481	0.000*	0.395	0.199-0.785	0.008*
	Somali	0.328	0.168-0.641	0.001*	0.234	0.107-0.515	0.000*
	SNNPRS	0.164	0.082-0.328	0.000*	0.406	0.191-0.861	0.019*
	Tigray	0.551	0.339-0.896	0.016*	0.154	0.064-0.373	0.000*

*P≤ 0.05

297 ## 4. Discussions

298 COVID-19 is an infectious disease caused by sever acute respiratory coronavirus 2 (SARS-
299 CoV-2) and its being pandemic poses a significant threat to public health (9). Given that the
300 disease is pandemic threat with no vaccine or proven treatment drug, preventive measures are
301 the most essential methods available to reduce the infection rates and control the spread of the
302 disease. This implies that public adherence to preventive and control measures are essential to
303 curb the disease. The extent of public adherence to preventive and control measures is affected
304 by their knowledge, attitude and practice (KAP). Therefore, this study was envisioned to assess
305 the KAP of the Ethiopian population for the control of COVID-19.

306 The finding has shown that the participants level of COVID-19 knowledge is unsatisfactory.
307 Only 42% of the respondents achieved a satisfactory knowledge score and the result is lower
308 than most previous reports from various countries (2, 12, 18, 22-24). Our study has shown that
309 Ethiopians had lower level of COVID-19 knowledge than Chinese (80.5%) ((24), Saudi Arabia
310 (81.6%)(23), Bangladesh (54·87%) (25), Malaysia (80.5%) (22) and Tanzania (84.4%) (26)
311 but similar with a study reported from Cameroon (43,7%) (27).

312 Poor level of knowledge of Ethiopians towards COVID-19 could make the spread of the
313 pandemic worst coupled with the country's limited capacity of testing, contact tracing and
314 isolation of suspected cases. Until the end of June 2020, Ethiopia has tested only less than 0.3
315 million peoples among the 114 million population indicating that Ethiopia is far from achieving
316 the pandemic control.

317 Knowledge scores significantly differ across socio-demographic factors which underlines the
318 need for targeted public awareness campaign. Although most of the respondents (73.6%) have
319 heard about COVID-19, only 42.4% and 37.8% knew COVID-19 transmission and clinical
320 manifestations, respectively. Furthermore, only less than 20% of the respondents knew that

321 currently there is no effective drug to cure COVID-19 nor vaccines to prevent the infection.
322 This poor level of knowledge towards COVID-19 could be due to limited engagement of
323 Ethiopian institutions, religious sectors, political parties and policy-decision makers to generate
324 contextual knowledge platform to provide an easy and accessible ways of getting credible
325 information. It could be also due to top-down community awareness campaigns, lack of
326 engaging diverse groups by the government, communication overload as large and conflicting
327 information are directed at federal, regional state, and local health bureau from multiple sources
328 which challenges the credibility and acceptability of the information by the general public.

329 Multivariable logistic regression analysis has shown that respondents from Oromia and
330 Amhara regions are 55% and 50% more likely to be less knowledgeable about COVID-19
331 respectively than other regions. The poor level of COVID-19 knowledge in this two regions
332 could be due to the fact that the majority of the Oromia and some parts of Amhara regional
333 states have been under the state of emergency since 2019 which restricts citizens from freedom
334 of expression and information exchange. This finding is very important since it may indicate
335 that more effort should be exerted to deliver the desired message in these two most populous
336 regions of the country, which account for more than 65% of the population of the country, (28)
337 to control the spread of the disease.

338 Majority of the respondents (59.6%) have no confidence on the government to control the
339 nationwide outbreak of the disease and 57.1% of the respondents disagree with the current
340 introduction of state of emergency to curb the spread of COVID-19 by the government.
341 Unexpectedly, half of the respondents do not agree with the principles of COVID-19
342 prevention methods such as hand washing, social distancing, avoiding non-essential travel and
343 self-isolation symptomatic patients. As a result, only one in five respondents practice COVID-
344 19 prevention measures satisfactorily. It is very difficult to explain why the attitude and practice
345 of the public to fight COVID-19 is low unlike in other countries such as China (24), Egypt (29)

346 , Sudan (30) and Tanzania (26). One reason could be the top-down flow of government
347 procedures to contain the virus may be perceived as authoritarian attempts by government to
348 consolidate control, leading to a loss of faith in the government. The government declared the
349 state of emergency to fight COVID-19 on April 8, 2020 although opposition parties explained
350 their concern that the state of emergency has been initiated several times and it has been abused
351 to violate the rights of citizens and other political activists rather than COVID-19. Another
352 reason could be related to poverty and food insecurity. The state of emergency weigh most
353 heavily on the poor, who are often part of the informal economy and thus dependent on day-
354 to-day making money to feed themselves and their families. For many of them, a day without
355 work means a day without food. Hence, they resist to follow government advice.

356 The attitude of the respondents toward COVID-19 significantly varies across some
357 sociodemographic factors. Although rural residents had lower level of COVID-19 knowledge,
358 a significantly higher proportion of (59.2%) them had favourable attitude than urban residents
359 (37.1%) towards COVID-19. Multivariate logistic regression analysis has shown that the odds
360 of favourable attitude of being a rural resident was twice than being an urban resident. This
361 could be due to the fact that rural residents have limited access to various information sources
362 particularly on social media (31). Hence, they largely depend on the information from the local
363 and national governors. Rural residents are also less likely than the urban residents to translate
364 service dissatisfaction into discontent with their government and hence have more trust in
365 government and evaluate information from local and national officials more positively than
366 urban peers (32).

367 Only one in 5 of the respondents adhered to COVID-19 prevention measures either usually or
368 always. While a third of respondents never wash their hands with soap, more than 80% of the
369 respondents had never applied a 2-meter social distance rule at least once. Ethiopia is among
370 one of the poorest sub-Sharan countries where a significant proportion of the population (70-

371 80%) have no access to adequate water supply, sanitation and hygiene facilities (33) which
372 challenges the handwashing practice to limit the spreading of COVID-19. Maintaining social
373 distance is unattainable practice in Ethiopia since majority of the citizens live in slums. About
374 80% of Addis Ababa (Finfinnee), the capital of the country, is considered slum areas,
375 characterized by widespread sanitation challenges where families live in crowded rooms and
376 are exposed to health and safety risks (34).

377 The ability of the government to persuade people to internalize the externality they would
378 impose on the community by not reducing their mobility is one of the most important elements
379 of compliance (35). This is particularly important where the ability to enforce lockdowns on a
380 large scale is unattainable. Evidence from different countries indicates that political beliefs,
381 coupled with differences in media consumption, have important implications for risk
382 perceptions and compliance with social distance and the Ethiopian government should revisits
383 its COVID-19 prevention strategy (35).

384 Strengthening of government measures, community-based sensitization and health education
385 programs will go a long way to prepare the community to overcome the pandemic. Providing
386 this education to the population will help fill the knowledge gaps reflected and correct the
387 misperception regarding the attitude of the population towards the disease which ultimately
388 improves the practice.

389 5. Conclusions and recommendations

390 In summary, the present study was able to provide a comprehensive investigation of the
391 knowledge, attitude and practice of Ethiopians toward COVID-19. The finding suggest that
392 Ethiopians have inadequate level of knowledge on COVID-19 and are generally have a mixed
393 outlook on overcoming the pandemic. The poor adherence to COVID-19 prevention practice
394 by the public underlines the need for urgent reinforcing preventive measures and intensifying

395 sensitization campaigns to fill the knowledge gap of the population with regards to COVID-19
396 and to persuade people to follow the preventive measures set by the government. At the same
397 time, there is a need to evaluate the impact of these measures on the knowledge and practices
398 of the population with the progression of the pandemic in Ethiopia. Finally, we believe that the
399 study will inspire the healthcare authorities, and media to spread more COVID-19 related
400 accurate knowledge which ultimately results in better preventive practices toward COVID-19.
401 Since no proven medicine or vaccine is developed yet, the best way to curb the spreading of
402 the disease is maximizing knowledge and preventive practices toward COVID-19 at all levels.

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