Original Article

Knowledge and perceptions of COVID-19 among government employees in Ethiopia: A cross-sectional study

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Abstract

Background: Knowledge and perceptions of the public about the 2019 coronavirus disease (COVID-19) play a critical role in the prevention of the disease through adopting effective preventive measures. The aim of this study was to assess the knowledge and perceptions of COVID-19 as well as the source of information about the disease among government employees.

Methods: A cross-sectional survey of 1,573 government employees from 46 public institutions located in Addis Ababa was undertaken from 8th to 19th June 2020. Systematic random sampling or consecutive sampling techniques were used to select the study participants. Paper-based self-administered questionnaires were used for data collection. ANOVA test and t-test were used to assess the difference between the groups.

Results: The respondents demonstrated very high knowledge of the cause of COVID-19 (93%), its main clinical symptoms (>90%), modes of transmission (89%), and the main preventive measures (>90%). Almost all respondents reported that people with travel history (86.8%) or people with close contact with COVID-19 patients (93.5%) were at higher risk to coronavirus infection. About 51% of the participants reported that people without travel history or people who had no contact with confirmed cases were also at risk of infection. About 84% of the respondents perceived those older adults above 60 years were most at risk to die from COVID-19. The majority of the respondents reported that adults with other underlying health problems (95.4%), cigarette smokers (88.1%) and substance users (87.5%) were more likely to die from the disease. Television (32.2%) and health workers (30.5%) constituted the most trusted sources of information related to COVID-19.

Conclusions: This study has found higher levels of knowledge and perceptions among respondents about COVID-19. Efforts should be focused on improving the knowledge, perceived susceptibility, severity, and benefits of preventive measures by providing timely and adequate information through trusted sources of information. .
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Keywords: COVID-19, Ethiopia, Government employees, Knowledge, Perception, SARS-COV-2

Background

The worldwide rapid spread of the 2019 coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has led the World Health Organization (WHO) to declare it as a global pandemic on 11th March 2020 (1). This unprecedented transmission of the virus has already reached all countries and territories around the world and caused over 190 million confirmed cases and more than 4 million deaths worldwide as of 10th July 2021 (2). A total of 5.9 million COVID-19 cases and 150,902 deaths were reported from Africa as of 10th July 2021. The rapid transmission of the virus from person to person coupled with lack of effective medication and vaccines has posed serious challenges in controlling the pandemic.

The first confirmed COVID-19 case in Ethiopia was reported on 13th March 2020. As of 10th July 2021, a total of 276,871 confirmed COVID-19 cases with over 261,933 recoveries and 4,342 deaths were reported in the country (2). This is the highest number of COVID-19 confirmed cases in East Africa and the 5th across Africa. Most (83%) of the cases during the first couple of months were either imported or close contacts of the imported cases (3) and later dominated by community transmission (4). As of 25th October 2020, contacts of the confirmed cases contributed for about 23% of the total COVID-19 cases reported in Ethiopia (5). During our data collection period, the number of nationally confirmed cumulative COVID-19 cases increased from 2,156 on 8th June to 4,070 on 19th June 2020, with an 89% increase in less than two weeks. Children under the age of five years and between the ages of 5-15 years were also tested positive for COVID-19. As to the end of July 2021, the overall positivity and case fatality rates of Ethiopia are about 9% and 1.6%, respectively (5).

The initial mitigation measures of COVID-19 in Ethiopia focused on isolating and treating confirmed cases at the treatment center, tracing and quarantining contacts, 14 days mandatory quarantine of all passengers coming to the country, risk communication and educating the public about preventive measures to reduce the risk of transmission. Subsequently, Ethiopia adopted the recommendations of WHO's basic public health measures to reduce and contain the transmission of COVID-19 (6, 7). In addition, the Government of Ethiopia implemented a variety of policy actions and precautionary measures in response to the COVID-19 pandemic, such as airport surveillance and suspension

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of flights, travel restrictions, closure of international borders, flexible working arrangements, closing schools and universities, and suspending sporting and religious gatherings. Finally, a state of emergency that lasted between 11th April to 10th September 2020 was declared to counter and control the spread of COVID-19 and mitigate its impact (8).

Intense media coverage in Ethiopia about the COVID-19 outbreak began in early February 2020 and peaked in March especially after WHO declared its pandemic level (1) and the first confirmed case was reported in the country. Since then, awareness creation and updates of the situation of the pandemic in the country have been given on a daily basis to the public by the Ministry of Health (MoH) and Ethiopian Public Health Institute (EPHI) on mass media, including radio and television. In addition, daily updates of the COVID-19 situation and different risk communication and awareness creation messages have been posted on their Websites, Facebook and Twitter pages. Practically, all mass media in the country devoted extensive time to the coverage of various aspects of the pandemic, targeting the general public. Government health education messages via various mass media are the major source of information about COVID-19 and for promoting self-protective practices. These preventive messages generally emphasize frequent hand washing with soap and water; mask wearing, and social distancing measures, including staying at home as much as possible, avoiding close contact with people including shaking hands, and avoiding crowds and mass gatherings. However, the public uptake of such health protective behaviors during epidemics relies on having trust in the media and government information (9).

The literature on the previous outbreaks of infectious disease suggests that more knowledgeable people during periods of disease outbreaks tend to worry more about being infected, suggesting a link between knowledge and risk perception (10). Therefore, correct knowledge and positive perceptions and attitudes have paramount importance in preventing the transmission of the virus through enhancing the preventive practices of people. Studies of people's perspectives provide timely and relevant evidence to identify the best preventive intervention that may be required to correct misconceptions and misunderstandings about the virus (11).

Although there is relatively high knowledge of COVID-19 among urban residents in Ethiopia, there are several misconceptions and understandings associated with the disease, including that COVID-19 can be prevented by drinking lemon or cured with garlic (12). Likewise, people's adherence and compliance to the preventive measures and law enforcement is generally weak to stop the nationwide spread of the virus. Since the first known confirmed COVID-19 case in Ethiopia, few studies were conducted to assess knowledge and perceptions of the people as part of the efforts in the fight against the disease (13-17). It is therefore important to understand people's knowledge and perceptions regarding COVID-19 to develop effective messages. The aim of this study was to assess the knowledge and perceptions of COVID-19 as well as the sources of information about the disease among government employees in Addis Ababa. The results of this study are important to inform future efforts focusing on the people's readiness to comply with pandemic control measures and the development of preventive strategies and health promotion programs.

Methods

Study area and setting

This study was conducted between 08-19 June 2020 in Addis Ababa city administration, three months after the first confirmed COVID-19 case was reported in Ethiopia. Addis Ababa city is administratively divided into 10 sub-cities and 116 districts. The projected population of the city was about 3.6 million in 2019, and was estimated to reach 4.5 million inhabitants by 2030 (18). Addis Ababa city has the highest burden of COVID-19 cases and deaths in Ethiopia. As of 1st August 2021, a total of 183,274 confirmed COVID-19 cases were reported from Addis Ababa, representing about 65% of the national cases (5). The responses to COVID-19 pandemic are in line with the national response strategy, focusing on physical distancing; hand washing; universal use of masks in public places; avoiding crowding and mass gatherings; tracing, testing, isolating and quarantining; closures of schools, places of worship, and sporting events; and limiting mobility and stay at home approaches. However, there have been a lot of misconceptions in the city about the COVID-19 pandemic, how the virus itself spreads and the necessary precautions that should be taken to prevent infection. In addition, policy responses to COVID-19 have had an impact on the socio-economic functioning of the people and are likely to impact their daily livelihoods.

Study design and sampling

This institution-based cross-sectional paper-based self-administered survey was conducted among government employees of 46 public institutions located in Addis Ababa city. As it was not feasible to conduct a representative household or online survey during this period, the researchers opted to use a self-administered survey. The study population for this study constituted all government employees, working in the selected government institution at the time of the survey and willing to participate in the study. A single population proportion sample size formula was used assuming a 50% prevalence estimate of the outcome variable at 95% confidence level, 4% precision, a design effect of two and 30% non-response rate. Accordingly, the minimum targeted total sample size for this survey was 1,560 respondents.

Purposive sampling was used to select public institutions located in Addis Ababa city. The institutions were mainly selected from the national or Federal Government Ministries, Addis Ababa city administration bureaus, sub-cities, and Oromia Regional State bureaus located in Addis Ababa. A total of 14 Ministry offices, 12 bureaus and six sub-city offices of Addis Ababa city administration, 18 bureaus

of Oromia Regional State, National and Commercial Bank of Ethiopia were included. The reasons for selecting those institutions were because of their diversity in terms of the types of employees, education, experience and their involvement in decision making processes at various regional and national hierarchies. Proportional numbers of participants were selected from each institution based on the estimated number of employees. Systematic random sampling or consecutive sampling techniques were used to select the study participants.

Data collection

The survey tools, self-administered questionnaires (SAQ), were developed by the research team. Some questions were adopted from the WHO tool for behavioral insights for COVID-19 (19). The SAQ was initially prepared in English and the final version was then translated into *Amharic* and *Afan Oromo* by two experienced personnel in order to make the questions understandable for the respondents. The tools were again back translated into English by other independent personnel in order to ensure consistency. The questions in the SAQ were organized into five sections: (i) socio-demographics and other details; (ii) knowledge of COVID-19 signs and symptoms, (iii) knowledge of the mode of transmission, (iv) knowledge of treatment and vaccine; (iii) knowledge of prevention methods; (iv) perceptions about susceptibility and severity; and (v) source of information.

A total of 20 data collectors were involved in the data collection of this survey. After obtaining informed consent from all potential participants, the questionnaires were distributed to the respondents. The respondents were informed to neither consult a friend nor read an online or any other material before responding to the questions. A guideline was developed by the research team to guide the data collectors and supervisors for data collection, quality assurance of data and ethical conduct during implementation of the survey in the selected institutions.

Statistical analyses

Data were entered into the Census Surveys Professional (CSPro) version 7.2 statistical software package and imported into the Statistical Package for Social Sciences (SPSS) version 23 (SPSS Inc., IBM, USA) for cleaning and analysis. Most of the knowledge and perception questions were designed as 'yes' or 'no'. The knowledge of COVID-19 was measured using six core questions: 1) cause of COVID-19 infection, 2) mode of transmission, 3) signs and symptoms, 4) incubation period, 5) availability of treatment or vaccine, and 6) knowledge on coronavirus prevention. The overall knowledge was assessed using a 15-item scales with responses recoded as '1=Correct' and '0=Incorrect'. These included one item on cause of infection, one item on mode of transmission, one item on incubation period, one item on treatment or vaccine, four items on signs and symptoms, and seven items on preventive measures. The items were summed to form a total knowledge score, with higher scores indicating greater knowledge (range=0-15). Cronbach's alpha for the knowledge score was 0.786. "High" level of knowledge in this study was defined as the overall scores greater than or equal to the mean ($\geq$14), since the median value was 15, and below 14 indicated poor knowledge. Perception about susceptibility and severity of COVID-19 was measured using four questions on a different scale which was analyzed separately.

Basic descriptive statistical methods such as frequencies, percentages and cross-tabulations were conducted to summarize the data and determine the differences between groups for selected demographic variables. Descriptive statistics by level of government were summarized using frequency distribution tables. Knowledge scores were compared according to demographic characteristics with independent samples *t*-test for two groups, or one-way between-groups analysis of variance (ANOVA) with Tukey HSD post-hoc tests for three or more groups. The statistical significance level was set at $p<0.05$.

Ethical approval

Ethical approval was obtained from the Institutional Review Board of the College of Health Sciences at Addis Ababa University (AAU) (protocol number: 042/20/SPH). Informed consent was obtained from each participant prior to responding to the questions. All methods were performed in accordance with the relevant guidelines and regulations set out in the Declaration of Helsinki. Participation was voluntary, anonymous and any participant could withdraw from completing the questionnaire at any time. Anonymity and data confidentiality were ensured.

Results

Characteristics of the sample

Of 1,730 eligible participants contacted from 46 government institutions, 1,573 (91%) completed the interview successfully and were used in the final analysis. Table 1 shows the distribution of the characteristics of the study participants. The mean (±SD) age of the respondents was 35 (±8.5) years (range: 19-66) and participants aged 30-49 years represented 63.9% of the sample. The majority of the respondents (64.2%) were male and 88.3% held a bachelor's degree or above. The mean (±SD) and median years of service in the institution was 6.6 (±6.4) and 4 years (range: 1-37), respectively. The mean (±SD) household size was 4.1 (±2) people (range: 1-14). About 40% of the respondents were drawn from national/federal institutions, followed by Addis Ababa city administration (38.7%) and Oromia Regional State (21.6%). The majority of respondents (86.1%) resided in Addis Ababa.

Table 1. **Characteristics of study participants, Addis Ababa, June 2020**

Characteristics	Total, n (%)
Gender (n=1,532)	
Male	983 (64.2)
Female	549 (35.8)
Age group (years) (n=1,436)	
18-29	397 (27.6)
30-39	656 (45.7)
40-49	261 (18.2)
≥50	122 (8.5)
Level of education (n=1,533)	
≤12th grade	47 (3.1)
Diploma*	132 (8.6)
Bachelor's degree	889 (58.0)
Master's degree or above	465 (30.3)
Year of experience in the institution (n=1,517)	
<5	762 (50.2)
5-9	406 (26.8)
10-14	181 (11.9)
≥15	168 (11.1)
Household size (n=1,506)	
1-3	583 (38.4)
4-5	622 (41.3)
6-7	226 (15.0)
≥8	75 (5.0)
Government level (n=1,573)	
National***	624 (39.7)
Addis Ababa	610 (38.7)
Oromia	339 (21.6)
Area of residence (n=1,502)	
Addis Ababa city	1,297 (86.1)
Out of Addis Ababa	209 (13.9)

*12th grade complete and 1 or more years of training; **Federal Government Employees

Knowledge of the causes, signs and symptoms, incubation period and treatment of COVID-19: The majority (92.9%) of the study participants knew that COVID-19 was caused by a viral infection, and this was consistently higher (>91%) across the three government levels (Table 2). Meanwhile 89.2% of the respondents correctly identified the mode of SARS-COV-2 transmission via respiratory droplets produced when an infected person coughs or sneezes. About 4% of the respondents stated that the coronavirus can be transmitted via airborne droplets or through eating uncooked food. The most commonly cited signs and symptoms of the COVID-19 included fever (96.9%), cough (95.2%), and difficulty in breathing (95.2%), headache (90.3%), sore throat (83.9%) and myalgia (81%). The less commonly reported signs and symptoms comprised of, loss of taste and smell (49.2%), runny nose (46.1%), diarrhea (41.2%) and coughing blood (31.7%). About 62% of the respondents from Oromia reported runny nose as a symptom of COVID-19 as opposed to 43.6% and 40% of respondents from national or Addis Ababa, respectively. Nearly 93% of the respondents cited correctly that the maximum incubation period for the novel coronavirus was up to 14 days. About 95% of the respondents correctly stated the unavailability of specific vaccine or antiviral treatment for COVID-19. Few respondents cited the availability of specific vaccine or treatment for COVID-19.

Table 2. **Distribution of coronavirus related knowledge of study participants by level of government, Addis Ababa, June 2020**

Knowledge	Government level, n (%)			Total, n (%)
	National*	Addis Ababa	Oromia	
Cause of COVID-19 infection				
Virus	578 (92.6)	558 (91.5)	326 (96.2)	1,462 (92.9)
Bacteria	15 (2.4	23 (3.8)	4 (1.2)	42 (2.7)
Parasite	10 (1.6)	8 (1.3)	4 (1.2)	22 (1.4)
Air pollution or climate change	5 (0.8)	7 (1.1)	1 (0.3)	13 (0.8)
Contaminated food or water	5 (0.8)	3 (0.5)	1 (0.3)	9 (0.6)
Other	11 (1.8)	11 (1.8)	3 (0.9)	25 (1.6)
Mode of transmission				
Spread through respiratory droplet	562 (90.1)	554 (90.8)	287 (84.7)	1,403 (89.2)
Spread through airborne droplet	11 (1.8)	19 (3.1)	2 (0.6)	32 (2.0)
Spread through eating uncooked food or raw meat	12 (1.9)	8 (1.3)	12 (3.5)	32 (2.0)
Other**	39 (6.3)	29 (4.8)	38 (11.2)	106 (6.7)
Signs and symptoms				
Fever	607 (97.3)	592 (97.0)	325 (95.9)	1,524 (96.9)
Cough	599 (96.0)	583 (95.6)	315 (92.6)	1,497 (95.2)
Shortness of breathing	593 (95.0)	583 (95.6)	321 (94.7)	1,497 (95.2)
Sore throat	534 (85.6)	492 (80.7)	294 (86.7)	1,320 (83.9)
Headache	562 (90.1)	549 (90.0)	309 (91.2)	1,420 (90.3)
Myalgia or fatigue	511 (81.9)	478 (78.4)	285 (84.1)	1,274 (81.0)
Coughing blood	194 (31.1)	165 (27.0)	140 (41.3)	499 (31.7)
Runny nose	272 (43.6)	244 (40.0)	209 (61.7)	725 (46.1)
Diarrhea	277 (44.4)	232(38.0)	139 (41.0)	648 (41.2)
Loss of taste and smell	315 (50.5)	250 (41.0)	209 (61.7)	774 (49.2)
Other	25 (4.0)	27 (4.4)	13 (3.8)	65 (4.1)
Maximum incubation period				
Up to 3 days	2 (0.3)	6 (1.0)	5 (1.5)	13 (0.8)
Up to 7 days	19 (3.0)	26 (4.3)	15 (4.4)	60 (3.8)
Up to 14 days	588 (94.2)	562 (92.1)	310 (91.4)	1,460 (93.4)
Don't know	15 (2.4)	16 (2.6)	9 (2.7)	40 (2.5)
Treatment or vaccine				
There is currently neither treatment or vaccine	600 (96.2)	585 (95.9)	312 (92.0)	1,497 (95.2)
Specific treatment available	4 (0.6)	6 (1.0)	1 (0.3)	11 (0.7)
Specific vaccine available	3 (0.5)	4 (0.7)	5 (1.5)	12 (0.8)
Both treatment and vaccine available	12 (1.9)	12 (2.0)	10 (2.9)	34 (2.2)
Don't know	5 (0.8)	3 (0.5)	11 (3.3)	19 (1.2)
Total, n (%)	**624 (100)**	**610 (100)**	**339 (100)**	**1,573 (100)**

*Federal Government Employees;

**Includes hand shaking, physical contact with people or covid-19 patient, contaminated water or food

Knowledge of COVID-19 preventive measures: Respondents' knowledge level of coronavirus virus prevention methods across the government levels was pervasive (Table 3). The overwhelming majority (>90%) of the respondents reported very high knowledge of coronavirus prevention that includes the most important prevention methods such as stay at home, physical distancing, avoiding close contact with people including hand shaking, the use of face mask, frequent hand washing with water and soap, avoiding touching eyes, nose and mouth, avoiding mass gatherings, movement restriction and use of sanitizers/disinfectants. Of the respondents, only 34.6 % thought that they had very good knowledge on how to prevent the spread of coronavirus, and 56.5% reported good or adequate knowledge to prevent the spread of the virus.

Table 3. **Distribution of respondents' knowledge of coronavirus preventive measures, Addis Ababa, June 2020**

Knowledge	Government level, n (%)			Total, n (%)
	National*	Addis Ababa	Oromia	
Knowledge of coronavirus prevention				
Staying at home	598 (95.8)	589 (96.6)	317 (93.5)	1,504 (95.6)
Physical distancing	598 (95.8)	587 (96.2)	310 (91.4)	1,495 (95.0)
Avoiding close contact with people including hand shaking	599 (96.0)	574 (94.1)	314 (92.6)	1,487 (94.5)
Use of face mask	603 (96.6)	574 (94.1)	317 (93.5)	1,494 (95.0)
Frequent hand washing with water and soap	600 (96.0)	577 (94.6)	316 (93.2)	1,493 (94.9)
Avoiding touching eyes, nose and mouth	600 (96.2)	567 (93.0)	309 (91.2)	1,476 (93.8)
Avoiding mass gatherings	589 (94.4)	565 (92.6)	315 (92.9)	1,469 (93.4)
Movement restriction	567 (90.9)	550 (90.2)	312 (92.0)	1,429 (90.8)
Use of sanitizers/disinfectants	569 (91.2)	547 (89.2)	301 (88.8)	1,417 (90.1)
Other	30 (4.8)	30 (4.9)	16 (4.7)	78 (5.0)
Self-rated knowledge on how to prevent the spread of coronavirus				
Very good knowledge	229 (36.7)	226 (37.0)	90 (26.5)	545 (34.6)
Good knowledge	350 (56.1)	337 (55.2)	201 (59.3)	888 (56.5)
Poor knowledge	31 (5.0)	33 (5.4)	33 (9.7)	97 (6.2)
Very poor knowledge	9 (1.4)	12 (2.0)	9 (2.7)	30 (1.9)
Don't know	5 (0.8)	2 (0.3)	6 (1.8)	13 (0.8)
Total, n (%)	**624 (100)**	**610 (100)**	**339 (100)**	**1,573 (100)**

*Federal Government Employees

Overall knowledge score: The mean knowledge score of the respondents was calculated, and values greater than or equal to the mean value were taken as "high" level of knowledge. The participants demonstrated high level of knowledge on the main clinical symptoms of COVID-19 (>90%), the main preventive measures (>90%), the lack of effective cure for COVID-19 (95%) and the maximum incubation period (93%). Table 4 shows the distribution of socio-demographic characteristics and the mean knowledge score. Overall, the majority (82.4%) of the respondents had '*high'* knowledge about COVID-19. Generally, the respondents demonstrated higher knowledge scores with the mean score of 14.0±1.69, and 59% scored 100%, on a scale of 15. There was no statistically significant difference in knowledge scores between male (14.1±1.71) and female (14.0±1.92) respondents, t (1530) = 0.302 (two-tailed), with very small magnitude of the differences in the means (mean difference = 0.098, 95% CI: -0.088 to 0.285, p=0.302). The difference in the mean knowledge scores was also not significant between educational groups, age groups, year of experience, household size, residence, whether self-reported chronic illness or tested for coronavirus or not. However, there was a statistically significant difference in the mean knowledge scores among the three government levels, F (2, 1570) = 3.60, p=0.028. The Post-hoc comparisons using the Tukey HSD test indicated that the mean knowledge score for Oromia was significantly lower than the national (mean difference = -0.328, 95% CI: -0.61 to -0.04, p=0.020), but not significantly different from Addis Ababa respondents (p=0.164). The mean knowledge scores did not differ significantly between national and Addis Ababa respondents (p=0.569).

Table 4. **ANOVA/ t-tests for mean knowledge scores regarding COVID-19 between groups (n=15 items), Addis Ababa, June 2020**

Characteristics	Mean±SD	ANOVA/t-test	*P*-value
Gender			
Male	14.1±1.71	1.03	0.302
Female	14.0±1.92		
Age group (year)			
18-29	14.0±1.87		
30-39	14.1±1.71	1.54	0.203
40-49	14.2±1.42		
50-66	14.3±1.36		
Education			
≤12th grade	13.6±2.30		
Diploma	14.0±1.80	1.75	0.155
Bachelor's degree	14.1±1.85		
≥Master's degree	14.2±1.62		
Experience (year)			
<5	14.1±1.66		
5-9	14.0±2.02	0.62	0.599
10-14	14.1±1.66		
≥15	14.2±1.45		
Household size			
1-3	14.0±1.99		
4-5	14.2±1.54	2.37	0.068
6-7	14.2±1.43		
≥8	14.1±1.87		
Government level			
National*	14.2±1.61		
Addis Ababa	14.1±1.75	3.60	0.028**
Oromia	13.8±2.23		
Residence			
Addis Ababa	14.1±1.71	0.98	0.330
Out of Addis Ababa	14.0±2.16		
Tested for coronavirus			
Yes	13.9±1.96	-1.89	0.068
No	14.2±1.62		
Self-reported chronic illness			
Yes	14.2±1.62	0.62	0.534
No or DK	14.1±1.71		

*Federal Government Employees; ***Significant at 0.05 level (2-tailed).*

Perceptions about susceptibility and severity of COVID-19: Almost all respondents correctly stated that people with recent travel history abroad (86.8%) or people with close contact with COVID-19 patients (93.5%) were the high-risk group most likely to be infected with the virus (Table 5). However, more than half (50.9%) of the study participants reported that people without neither travel history nor had contact with confirmed COVID-19 cases are also most likely to be infected with coronavirus. About 84% of the respondents perceived those older adults above 60 years were the most at risk to die from COVID-19. Meanwhile, 62.8% of the study participants reported that both males and females have an equal chance of dying from the disease, although 22.2% perceived that men had a higher chance of dying from COVID-19. With the group of adults more likely to die if they contracted COVID-19, the majority of the respondents reported that adults with other underlying health problems (95.4%), adults who are cigarette smokers (88.1%) and adults who frequently use substances such as alcohol, *khat* and cannabis (87.5%) were more likely to die from COVID-19. In contrast, just over one-fifth (21.9%) of the respondents reported that adults without other underlying health problems were also most likely to die from COVID-19.

Table 5. **Distribution of responses on perceptions about susceptibility and severity of COVID-19, Addis Ababa, June 2020**

Susceptibility and severity perceptions	Government level, n (%)			Total, n (%)
	National*	Addis Ababa	Oromia	
Which groups of people are most likely infected by a coronavirus?				
People with recent travel history abroad	551 (88.3)	533 (87.4)	281 (82.9)	1,365 (86.8)
People with close contact with COVID-19 patients	583 (93.4)	578 (94.8)	310 (91.4)	1,471 (93.5)
People with neither travel history nor contact	339 (54.3)	336 (55.1)	125 (36.9)	800 (50.9)
with confirmed COVID-19 cases	42 (6.7)	36 (5.9)	21 (6.2)	98 (6.2)
Other				
Which groups of people are most likely to die from COVID-19?				
Children/adolescents	4 (0.6)	3 (0.5)	13 (3.8)	20 (1.3)
Young adults	11 (1.8)	9 (1.5)	25 (7.4)	45 (2.9)
Older adults (above 60 years)	542 (86.9)	488 (80.0)	286 (84.4)	1,316 (83.7)
Other	67 (10.7)	110 (18.0)	15 (4.5)	192 (12.0)
Is it male or female that is most likely to die from COVID-19?				
Male	139 (22.3)	125 (20.5)	85 (25.1)	349 (22.2)
Female	16 (2.6)	19 (3.1)	30 (8.8)	65 (4.1)
Both are equally likely to die	413 (66.2)	400 (65.6)	175 (51.6)	988 (62.8)
Don't know	56 (9.0)	66 (10.8)	49 (14.5)	171 (10.9)
Which groups of the adults are more likely to die from COVID-19?				
Adults with other underlying health problems	606 (97.1)	578 (94.8)	316 (93.2)	1,500 (95.4)
Adults who are cigarette smokers	565 (90.5)	524 (85.9)	297 (87.6)	1,386 (88.1)
Adults who frequently use substances (alcohol, *khat*, cannabis)	563 (90.2)	535 (87.7)	279 (82.3)	1,377 (87.5)
Adults without other underlying health problems	133 (21.3)	152 (24.9)	59 (17.4)	344 (21.9)
Other	19 (3.0)	17 (2.8)	12 (3.5)	48 (3.0)
Total, n (%)	**624 (100)**	**610 (100)**	**339 (100)**	**1,573 (100)**

*Federal Government Employees

Sources of information about COVID-19: The relative importance of various sources of information about COVID-19 was assessed in this study, and electronic media such as television (85.5%), social media (74.1%), online materials (71.1%) and radio (60.8%) constituted the primary source of information, followed by health workers (66.6%), friends/family members (54.1%) and print materials (35.4%) (Table 6). Television (32.2%) and health workers (30.5%) constituted the most trusted source of information related to COVID-19 and the least trusted sources of information were friend/family members (0.7%) and print materials (2%). The respondents also reported a combination of trusted sources of information on COVID-19 such as radio/television, television/ health workers, radio/television/ health workers, websites such as MoH/EPHI and WHO.

Table 6. **Distribution of the sources of information about COVID-19 by level of government, Addis Ababa, June 2020**

Source of information	Government level, n (%)			Total, n (%)
	National*	Addis Ababa	Oromia	
Main sources of information on COVID-19				
Television	525 (84.1)	523 (85.7)	297 (87.6)	1,345 (85.5)
Radio	367 (58.8)	389 (63.8)	200 (59.0)	956 (60.8)
Print materials	224 (35.9)	203 (33.3)	130 (38.3)	557 (35.4)
Online materials	453 (72.6)	407 (66.7)	258 (76.1)	1,118 (71.1)
Social media	473 (75.8)	431 (70.7)	261 (77.0)	1,165 (74.1)
Health workers	402 (64.4)	389 (63.8)	257 (75.8)	1,048 (66.6)
Friends/family members	328 (52.6)	312 (51.1)	211 (62.2)	851 (54.1)
Other	15 (2.4)	9 (1.5)	9 (2.7)	33 (2.1)
Most trusted source of information on COVID-19				
Television	209 (33.5)	206 (33.8)	91 (26.8)	506 (32.2)
Radio	23 (3.7)	25 (4.1)	15 (4.4)	63 (4.0)
Print materials	21 (3.4)	11 (1.8)	0.0	32 (2.0)
Online materials	56 (9.0)	32 (5.2)	23 (6.8)	111 (7.1)
Social media	58 (9.3)	65 (10.7)	14 (4.1)	137 (8.7)
Health workers	164 (26.3)	192 (31.5)	123 (36.3)	479 (30.5)
Friends/family members	3 (0.5)	8 (1.3)	0.0	11 (0.7)
Other	74 (11.9)	62 (10.2)	64 (18.9)	200 (12.7)
Total, n (%)	**624 (100)**	**610 (100)**	**339 (100)**	**1,573 (100)**

*Federal Government Employees

Discussion

This study aimed to investigate the knowledge and perceptions of COVID-19 among government employees selected from 46 public institutions in Addis Ababa during June 08 to 19, 2020. At the time of this study, the spread of COVID-19 in Addis Ababa cumulatively increased by 84% from 1,625 on 8th June to 2,988 on 19th June, with an average of 114 new infections per day. This study revealed higher levels of knowledge about COVID-19 and its preventive measures. The prevention and control of such a pandemic is strongly influenced by people's ability to comply with the recommended preventive public health measures, which are often associated with the knowledge of the people and how they perceive their susceptibility to infection (20-24).

The respondents demonstrated higher knowledge about the cause of COVID-19, the main modes of transmission of the virus, main signs and symptoms, incubation period and unavailability of specific treatments or vaccine. Studies indicate that the most prevalent clinical symptoms among COVID-19 infected individuals include fever, cough, and fatigue (25). Studies conducted in Ethiopia towards the end of March 2020 showed a high knowledge level about the main clinical symptoms, route of transmission of COVID-19 and preventive practices (13, 15). Studies revealed that an increase in knowledge and perceived risk for a particular health problem would influence preventive behaviors to reduce the risk of developing the health problem. This means people's knowledge and perceptions about COVID-19 play a central role in the prevention and control of the pandemic through influencing and shaping their specific preventive behaviors such as hygiene and social distancing (11, 26, 27). Higher knowledge and risk perceptions about COVID-19 were associated with increased protective behavior change (28).

The current study shows that respondents were highly knowledgeable about the preventive measures of COVID-19, with the most commonly cited measures constituting staying at home, physical distancing, avoiding close contact with people including hand shaking, the use of a facemask, frequently washing hands, avoiding mass gatherings, movement restriction, and use of sanitizers/disinfectants. A similar study conducted in Ethiopia in April 2020 also showed that about 90% of the participants had good prevention knowledge of maintaining physical distance and washing hands frequently (14). Several studies conducted in other countries have also indicated high levels of COVID-19 knowledge among the general population (29-32). The study found that the overall knowledge about the causes and symptoms, the unavailability of a vaccine or specific antiviral treatments, and the main preventive measures of COVID-19 was '*high*'. This finding was not surprising since the study was conducted three months after the first confirmed COVID-19 case in Ethiopia, where massive awareness creation, intensive public health interventions and policy measures have been implemented. The seriousness of COVID-19 and the overwhelming information about the disease has helped the population know more about this pandemic. Similar studies in Africa such as Ghana (31), Nigeria (33), Tanzania (34) and beyond (30, 32) revealed high COVID-19 knowledge among their study participants.

The findings of the current study also show that the respondents were highly knowledgeable about the group of people most at risk of contracting coronavirus, and the majority reported that people who had contact with COVID-19 patients and people with recent history of international travel were most likely to contract the virus. These findings are associated with the number of people infected with the virus during the first couple of

months after the onset of the epidemic in Ethiopia where the majority of the cases were imported from abroad or the infections were linked to the other confirmed COVID-19 cases. More than half of all respondents cited that people without a history of travel or contact with confirmed cases are also likely to acquire the coronavirus infection, which is highly aligned with the current COVID-19 situation in the country, particularly with the widespread occurrence of community transmission. Current observations in Ethiopia suggest that people of all ages are generally susceptible to contract the coronavirus infection. However, studies in China during the early stage of the outbreak showed that people who were in close contact with patients with symptomatic and asymptomatic COVID-19, including health care workers and other patients in the hospital, were at higher risk of infection (35).

Regarding the group of people most at risk to death after being infected by coronavirus, the majority of the study participants reported adults with other underlying health problems, older adults (above 60 years) , adults who are cigarette smokers and people who frequently use substances such as alcohol, *khat* and cannabis. A study from Jimma showed that 73% of the respondents knew that elderly people who have chronic illnesses are at higher risk of developing a severe form of COVID-19 (15). A recent multivariable analysis that used data from China found increasing odds of inpatient death among the elderly (36). A meta-analysis with more than half million COVID-19 patients from different countries revealed a significantly higher mortality in patients older than 60 years (37). Likewise, being under 60 years with a body mass index (BMI) ranging from 30 to 34 is associated with a likelihood of being admitted to acute and critical care, compared to those with a BMI lower than 30 (38). This reveals that a younger person who is experiencing other health complications or with higher BMI faces as much risk as the elderly. Of the COVID-19 patients investigated in another study in China, 48% suffered comorbidity, marked by a high prevalence of hypertension, diabetes, and coronary heart disease (36).

Our findings indicate that the majority of the study participants reported that both men and women have an equal chance to die from COVID-19, although about one-fourth of the respondents perceived those men had more chance of dying from COVID-19. Men and women generally seem to respond differently to the effects of COVID-19. Available evidence suggests that men are more likely to die of COVID-19 than women, owing presumably to the biological and lifestyle factors (39-41). Biological factors lead to sex-differentiated susceptibility to illness. For example, men are more prone to acute health problems, partly explaining why women live a little longer than men (42). There is also a sex difference in lifestyle or health behavior. Men smoke and consume alcoholic beverages more than women (43). As far as the current evidence is concerned, men and women experience similar odds of COVID-19 infection, but men are disproportionately exposed to the severest outcomes, including death (44).

During an emerging infectious disease like the coronavirus, receiving timely and accurate information enables individuals to take appropriate actions to protect themselves, shaping their risk perception. In the current study television, social media, online materials, health workers and radio were identified as the main sources of information for COVID-19. In addition, television and health workers were reported as the most trusted sources of information related to COVID-19. Similar surveys conducted at the early phase of the pandemic in Ethiopia also showed social media and television to be the main source of information about COVID-19 (13,14). In Nigeria, the most common sources of information about COVID-19 were identified as television and radio, followed by social media and the internet (45). Under health emergency circumstances, adequate literature or reading materials may not be readily available, and in such a situation, television, radio, internet and social media play a major role in providing up-to-date information to the public. However, it should be noted that access to television and social media depends on the local contexts such as on the availability of electricity and internet.

Despite generating highly valuable and timely findings, this study was not without some limitations. Firstly, due to limited internet access and online information sources in the country, the study was based on paper-based self-administered survey that only included government employees in Addis Ababa, where vulnerable populations and illiterate people were not captured in the study. Secondly, due to the threat of the pandemic and the social distancing rule, it was not possible to conduct a face-to-face interview. Thirdly, the data presented in this study are self-reported and partly dependent on the respondent's honesty and recall ability, thus they may be subject to recall and social desirability biases. They also could have been affected by selection bias. Fourthly, the study was conducted only among government employees, and their level of knowledge and perception might be higher than the general population. Nevertheless, this study provides valuable information about the knowledge and perception of COVID-19 among government employees, and the findings can be used to direct specific public health interventions or messages to the government employees.

Conclusions

The results of this study identified higher levels of knowledge and perceptions among respondents about COVID-19. Knowledge and perceptions have great roles in behavioral change and the focus should be on improving the knowledge, perceived susceptibility, severity, and benefits of preventive behavioral changes. Understanding how the public responds to the global pandemic like COVID-19 is useful in identifying ways of encouraging behavior change during the early stages of any infectious disease outbreak.

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