

Knowledge and Precautionary Behavioral Practice Toward COVID-19 Among Health Professionals Working in Public University Hospitals in Ethiopia: A Web-Based Survey

This article was published in the following Dove Press journal:
Risk Management and Healthcare Policy

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Background: The novel coronavirus disease, COVID-19, causes massive death, threatens the life and health of the world population. Thousands of health professionals were died and tested positive.

Objective: This study was designed to determine knowledge and precautionary behavior practice for coronavirus disease-19 among health professionals working in public university hospitals in Ethiopia.

Methods: A web-based online survey was conducted on health professionals working in Ethiopian public university hospitals. A survey questionnaire consisted of socio-demographic, coronavirus disease knowledge questions and precautionary behavioral practice. The survey questions were designed using Google form. All health professionals working (academic and clinical staff) in university hospitals were invited to participate in the online survey carried out from May 1 to 14, 2020. The data were analyzed using the Statistical Package for Social Sciences version 24.0. Descriptive statistics were computed, and tables and figures were used to present the results. Linear regression analysis was used to identify knowledge-related factors independently associated with precautionary behavior practice.

Results: A total of 273 health professionals participated in this study. The mean ($\pm$ SD) age of participants was 31.03 ± 5.11 . Two-third (61.5%) and one-fourth (26%) of participants attended second degree and medical doctors, respectively. More than one-fourth of the study participants (27.5%) reported social media as the source of information. In this study, we found a significant gap between the level of knowledge and practical implementation of the recommended precautionary measures, especially for wearing masks and gloves. The final multiple linear regression analysis indicated a positive association between knowledge of the source of infection, incubation period, and mode of disease transmission with recommended behavioral practice.

Conclusion and Recommendation: There was a significant gap in the implementation of the behavioral practice, especially for wearing masks and gloves. Therefore, there is a need to motivate and monitor health professionals' adherence to recommended precautionary measures.

Keywords: COVID-19, knowledge, precautionary health behavior, Ethiopia

Introduction

The novel coronavirus disease, COVID-19, causes massive death, threatens the life and health of the world population, and intensive economic loss since it is declared a pandemic by the World Health Organization (WHO).¹ The virus is characterized

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by a high transmission rate, which causes difficulty in controlling the spread of the disease.² Implementation of public health measures, which include the promotion of the use of personal protective practices such as the use of face masks, wearing of gloves, frequent hand washing, restriction of movement to the more affected areas, maintaining social/physical distance, avoiding touching the nose, mouth, and eyes, were found to be the only proven preventive option to halt the pandemic.³ The effectiveness of outbreak control will mainly depend on the behavioral response of the society and adherence level to the recommended precautionary measures.⁴

In different countries, the health-care system designed effective planning to cope with the COVID-19 pandemic. Many countries face health workforce challenges, including shortages, mal-distribution and misalignment between population health needs and health worker competencies⁵ and the case is not exceptional in Ethiopia. Following the wide spread of COVID-19 in African region and Ethiopia, concerns have been raised on safeguarding the health professionals as they are highly vulnerable to the outbreak. Unprecedented spread of the infection largely affected the health professionals and generated shortage.⁶

Poor understanding and risk perception of the disease among health-care workers (HCWs) may result in delayed recognition and treatment, resulting in the rapid spread of the infection.⁷ Interventions targeted in increasing the knowledge of health-care providers that are dealing with suspected or confirmed COVID-19 can significantly limit the spread of the outbreak.⁸ Furthermore, health professionals are working with inadequate personal protective equipment (PPE), and many have died, and thousands have tested positive.⁹ Evidence from a cross-sectional study points out a significant number of health-care workers have inadequate knowledge about COVID-19. According to this study, 61% and 63.6% of HCWs had a poor understanding of COVID-19 transmission and symptom onset, respectively. Besides, a significant number of HCWs (22%) showed negative perceptions of COVID-19.⁷

Since June 9, 2020, there are about 2156 COVID-19 confirmed cases and 27 deaths reported in Ethiopia, and more than a hundred health professionals are affected by the illness.¹⁰ During this period, the outbreak is prevalent in the major cities and towns in the gateways. As the country is in the early stage of infectious disease, the chance of limiting the spread is more feasible during this stage. Thus, this survey designed to explore health professionals' knowledge

and precautionary behavioral practice toward COVID-19. This finding is crucial in limiting the spread of the pandemic and recommending policymakers to institute effective intervention strategies that safeguard the lives of health professionals and the public at large.

Materials and Methods

Study Design and Setting

A self-administered online survey designed on Google form from May 1 to 14, 2020, and this manuscript is a part of an online study titled

COVID-19 pandemic: psychological impact, perceived risk and preparedness among health care providers working in public university hospitals in Ethiopia: web-based survey.

The university hospitals are namely: Jimma Medical Center (JMC), Mizan Tepi University Hospital, Wollega University Hospital, Hawassa University Hospital, Wolayta Sodo University Hospital, and Arba Minch University Hospital. University hospitals were engaged in delivering curative treatment and preventive and rehabilitative services for millions of people in southern, southwestern, and western Ethiopia. For the current COVID-19 pandemic, each university hospital, including its clinical staff, were prepared for testing, treatment, and quarantine center.

Population

All teaching and clinical staff working in the selected public university hospitals in Ethiopia was considered a source population. Those who were volunteers to take part, filled, and re-submitted the survey questionnaire were considered the study population. A total of 273 health professionals took part in the study. Those who were on work leave did not take part in the survey.

Sample Size and Sampling Techniques

The minimum number of the sample size required for this study was determined by using the formula to estimate a single population proportion. The minimum sample size determination formula used is: $(n) = \frac{(Z_{\alpha/2})^2 P(1-P)}{d^2}$, where n denotes the minimum sample size, $Z_{\alpha/2}$ is the reliability coefficient of the standard error at a 5% level of significance = 1.96, and p is the proportion of health-care providers who had a poor perception about COVID-19 = 22%.⁷ Accordingly, the study participants were consecutively selected until the calculated sample size required is fulfilled; which took two weeks.

Data Collection Procedure and Measuring Tools

Data were collected using an electronically administered questionnaire. All staff invited to participate in the online survey. Official university e-mail addresses, personal e-mail addresses, and social media networking sites: Facebook and Telegram used to share the survey link to the staff. The URL link of the survey questionnaire is <https://docs.google.com/forms/d/1OVJ6FUfGNM3T8M16X3PeX5bq5l5SNycjSdw2jIDPrU>.

In the introduction section of the survey, the purpose of the study, informed consent, and the way to maintain confidentiality stated. The survey questions prepared to be delivered electronically by the English language to get a rapid response of individuals COVID-19 related knowledge and precautionary behavioral response. The first part of the instrument includes the socio-demographic characteristics of the participants (age, sex, educational status, type of profession, and professional engagement). Participants' knowledge was assessed using a 9-items questionnaire addressing clinical symptoms, mode of transmission, and knowledge of prevention strategies. The precautionary behavioral responses of respondents in undertook major protective measures to COVID-19 were assessed using 5-point Likert scale questions. The questions address the respondent's practice of avoiding sneezing/coughing, avoiding touching the face, nose, and eyes, avoiding large gatherings and public places, avoiding traveling to the affected areas, staying at home, using alcohol-based disinfectants, and wearing mask/gloves. The study tools were adapted from the WHO and other studies,^{4,11} and more detail of the questionnaire found as ([Supplementary file 1](#)).

Data Processing and Analysis

The collected data were checked, coded, and exported to Statistical Package for Social Sciences (SPSS) version 24 statistical software for cleaning and analysis. Descriptive statistics were computed and presented with a frequency table indicating the mean value and standard deviation with a 95% confidence interval. After checking for assumption, a factor score generated for knowledge question items through principal component analysis, and factors was load into components. The resulting score distributed with a mean of zero and a standard deviation of one. Linear regression analysis used to determine the relationship between individuals' risk perception and

behavioral response after verifying the lack of multicollinearity among explanatory variables, the linearity of relations, and the normality of the distribution. The variance inflation factor and tolerance test for the explanatory variables found to be less than 2 and 1, respectively. Statistical significance of independent predictors declared at a 95% confidence level and (p -value < 0.05) and Unstandardized β used for interpretation.

Results

Characteristics of the Study Participants

A total of 273 health professionals participated in this study. The mean ($\pm$ SD) age of participants was 31.03 $\pm$ 5.11 years and ranged from 23 to 48 years. Two-thirds (64.8%) of the study participants were engaged in academic service. Regarding educational attainment, type of profession, and sex of respondents, 61.5%, 26%, and 89% of participants attended Master's Degree (MSc), medical doctors, and male by sex, respectively ([Table 1](#)).

Table 1 Socio-Demographic Characteristics of Health Professionals Working in Public University Hospitals in Ethiopia, May 2020 (n = 273)

Variables	Variable Categories	Frequency (n)	Percentage (%)
Sex	Male	243	89
	Female	30	11
Age category	15–24	18	6.6
	25–34	201	73.6
	>35	54	19.8
Educational qualification	Bachelor Degree	96	35.2
	Masters Degree	168	61.5
	PhD	9	3.3
Type of profession	Nursing/Midwifery	121	44.3
	Medical doctors	71	26.0
	Anesthesia/	46	16.8
	sychiatry/		
	Ophthalmology	35	12.8
Professional engagement	Public health		
	Academics	177	64.8
	Clinical	81	29.7
	Both academics and clinical	15	5.5
Residence	Urban	267	97.8
	Rural	6	2.2

Knowledge and Source of Information Related to COVID-19

All study participants responded correctly to all preventive knowledge questions. Regarding the other knowledge components, the items that were least answered correctly by study participants were the knowledge of causative microorganism $n = 191$ (70%) and knowledge of incubation period $n = 220$ (80.6%) (Table 2). The principal component analysis used to generate factors and components that define the knowledge index. Factors including knowledge of the source of infection, causative microorganism, incubation period, clinical symptoms, disease complications, and the knowledge of treatment options fulfilled the assumption for the analysis and load into two components. Knowledge of causative microorganism, knowledge of treatment, and complication were load into component one and the other in component two. Regarding the participant's knowledge of major preventive measures, all participants found to respond correctly to all questions addressing recommended preventive measures. More than one-fourth of the study participants (27.5%) reported social media as the most common source of information (Figure 1).

Precautionary Health Behavioral Response

The recommended precautionary behavioral response of study participants assessed using a 10-item questionnaire that was scored on a 5-point (1–5) Likert scale. The lowest

mean scores were wearing gloves (1.82 ± 1.15), followed by wearing a mask (2.54 ± 1.82). Avoiding while people sneeze or cough had the highest mean score (4.0 ± 1.06) (Figure 2) and more complete data found in (Supplementary file 2).

Multivariate Linear Regression Analysis

The final multiple linear regression model indicated that participants' knowledge of the source of COVID-19 infection ($\beta = 3.53$, $P < 0.01$), knowledge of the mode of disease transmission ($\beta = 7.51$, $P < 0.01$), knowledge of the incubation period ($\beta = 11.33$, $P < 0.01$), and knowledge of the presence of curative treatment for COVID-19 ($\beta = 8.1$, $P < 0.01$) found to be independent predictors. Participants who knew the source of COVID-19 infection had 3.53 times more likely to practice recommended precautionary behavioral practices. Similarly, participants who knew of the incubation period of COVID-19 were eight times more likely to implement recommended precautionary behavioral practice (Table 3).

Discussion

This study provides evidence of knowledge and precautionary behavior practice toward COVID-19 among health professionals working in public university hospitals in Ethiopia. The findings of this study found out that the items that were least responded correctly by study participants were knowledge of causative microorganism and the incubation period. All health professionals responded correctly to all questions of the coronavirus disease preventive knowledge questions. Regarding the practice of recommended health behavior, almost all recommended protective measures practiced to the highest level. However, regarding wearing masks and gloves, the study found a significant gap between the level of knowledge and practical implementation of the recommended precautionary measures. The final multiple linear regression analysis indicated a positive association between knowledge of the source of infection, incubation period, and mode of disease transmission with recommended behavioral practice.

The knowledge of the study participants regarding preventive strategies or techniques in this study found to be much higher than the study by Bhagavathula et al.⁷ A similar cross-sectional study done in the Republic of China, China indicated that 89% of health-care providers are knowledgeable regarding preventive methods.¹² The possible reason for the variation might be study

Table 2 Knowledge Related to COVID-19 of Health Professionals Working in Public University Hospitals in Ethiopia, May 2020 ($n = 273$)

Knowledge Related Questions	Correct Frequency (%)	Not Correct Frequency (%)
Knowledge of causative organism of COVID –19	191 (70%)	82 (30%)
Knowledge of source of infection of COVID-19	232 (85%)	41 (15%)
Knowledge of mode of transmission	266 (97.4%)	7 (2.6%)
Knowledge of incubation period	220 (80.6%)	53 (19.4%)
Knowledge of the main clinical symptoms of COVID-19	238 (87.2%)	35 (12.8%)
Knowledge of major complication caused by COVID-19	221 (81%)	52 (19%)
Knowledge of treatment options of COVID-19	220 (80.6%)	53 (19.4%)

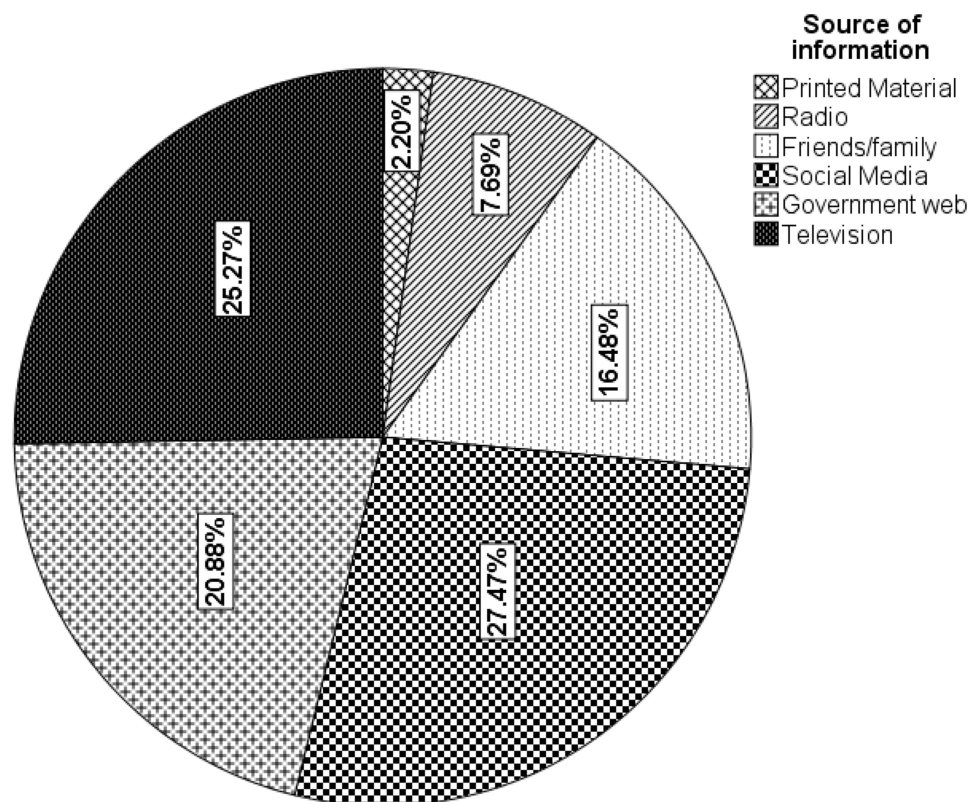


Figure 1 Most common source of information used by health professionals working in public university hospitals in Ethiopia (n = 273).

participants in this study majority of professionals who were involved in both delivering academic and professional services that allow them to have a better understanding and updated information regarding the disease. The majority of the study participants attended a Masters Degree and above in educational status. Furthermore, the nature of their work and sense of responsibility as health professionals drive them to acquire more knowledge, which is supported by a similar study.¹³

Concerning knowledge related to the incubation period, treatment, and complications, more than 80% of participants found to correctly respond to these items, which is higher than another study.⁷ However, those items we least correctly answered from knowledge items. Additionally, many health professionals had knowledge gaps in treatment options and reported the presence of antiviral treatment and vaccine for the virus. The finding might be explained that the majority of health professionals obtained information from unauthenticated sources like social media. The vast diversity of information available through web media is spreading quickly and prone to bias, which can misguide the professionals.

The majority of participants' implemented the recommended precautionary measures to an acceptable level except for wearing masks and gloves. The finding might be due to the study subjects were well educated, which helped them to better exercise protective behavior, and the higher perceived vulnerability level of the illness. This finding is supported by other studies.¹⁴ Regarding wearing masks and gloves, the study found a significant gap between the level of knowledge and implementation of the recommended precautionary measures. The mean scores of wearing masks and gloves in the current study found to be the lowest for items 2.54 and 1.82, respectively. The practice is less frequent, despite these is being an essential recommended protective measures by the WHO.¹⁵ The lower levels of usage declared in our study may be attributable to the poor habit of mask and glove-wearing, a perception that they interfere with performing tasks, lack of time, and shortage of PPE in the health facilities. A study done in China indicated inadequate PPE as a reason for health professionals becoming infected with the virus.¹⁶ The scientific understanding and precautionary behavioral practice of health professionals in the current study area is promising. However, a significant gap

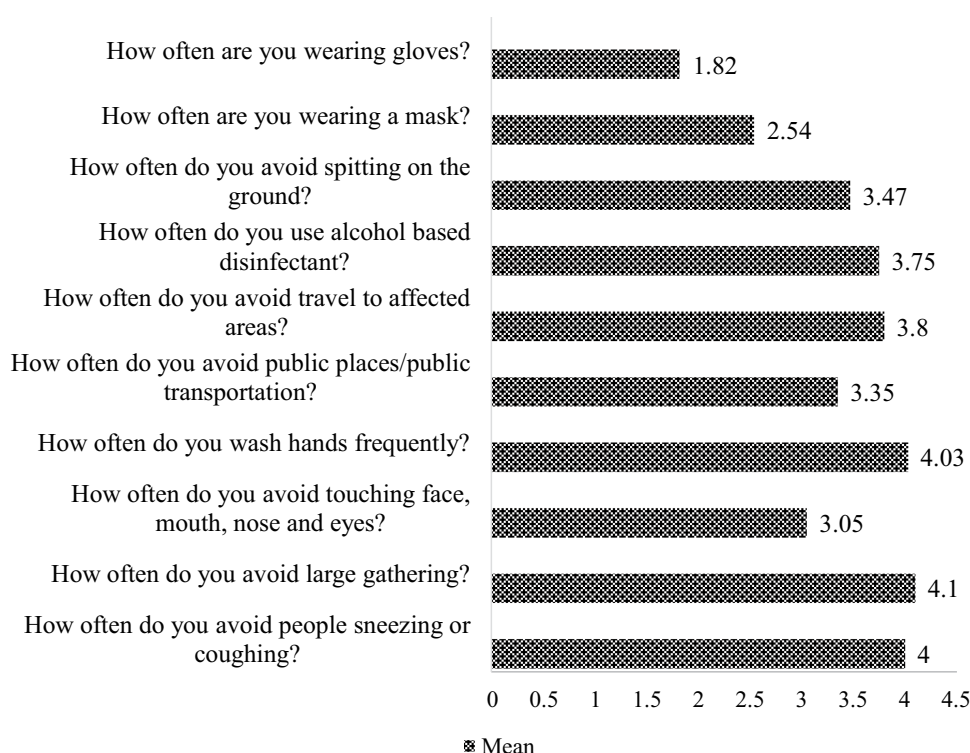


Figure 2 Mean score (on a 5-point Likert scale) of specific precautionary health behavior practice of health professionals working in Ethiopia University Hospitals, May 2020 (n = 273).

is observed between overall knowledge and the application of behavioral practice for wearing masks and gloves. Thus, there is a need to further intensification of more effective ways of creating behavioral change in supporting professionals to adhere to major health precautionary measures is important. The health facilities need to in place a safety protocol that encourages and enforces the protective behavioral response. Furthermore, continues monitoring of the adherence protocol need to be followed by the monitory

team and ways to positively reinforce the professionals need to be exercised.

Strength and Limitations of the Study

The main strength of this study is that researchers used a Likert scale to measure the outcome variable, which is much better to measure behavior than the dichotomized response. The limitation of this study was that the

Table 3 Adjusted Multiple Regression Analysis Showing Factors Independently Associated with Precautionary Health Behavior by Health Professionals Working in Public University Hospitals in Ethiopia (n = 273)

Variables	Unstandardized (β)	P-value	Collinearity Statistics	
			Tolerance	VIF
Age	0.08	0.14	0.88	1.13
Female	0.82	0.35	0.92	1.09
Knowledge of causative micro-organism of COVID disease	1.65	0.18	0.36	2.76
Knowledge of source of infection	3.53	<0.001	0.39	2.55
Knowledge of mode of transmission	7.51	<0.001	0.94	1.05
Knowledge of disease incubation period	11.33	<0.001	0.55	1.82
Knowledge of COVID-19 clinical symptoms	-9.29	0.21	0.48	2.11
Knowledge of presence of curative treatment for COVID-19	8.1	<0.001	0.34	2.92
Perceived understanding of government implementation strategy	0.65	0.13	0.87	1.14
Perceived scientific understanding of the infection	-0.7	0.759	0.9	1.11

measurement tools used relied on participants' self-reported data, which were prone to recall bias, and the data collection method allows the participants to over-report the precautionary behavioral practice. Furthermore, the population in the current survey mostly consisted of higher degree health professionals this may over-estimate the outcomes of the study.

Conclusion

The knowledge of the study participants regarding preventive strategies or techniques in this study found to be much higher. Although most participants applied recommended protective measures to an acceptable level, the finding found a significant gap between knowledge and behavioral practice for wearing masks and gloves. Furthermore, the finding indicated a statistically significant positive association between participants' knowledge of the source of infection, incubation period, and mode of disease transmission with recommended behavioral practice.

Abbreviations

COVID-19, Corona virus disease; HCW, health-care worker; MSc, Master's degree; PPE, personal protective equipment; SD, standard deviation; SPSS, Statistical Package for Social Sciences; SARS, severe acute respiratory syndrome; WHO, World Health Organization.

Data Sharing Statement

The data generated for this study are included in this article. The corresponding author confirms that files attached as supplementary file is the datasets of the study.

Ethical Approval and Consent to Participate

Ethical approval obtained from the Institute of Ethical Review Board of Jimma University with letter reference number IRB000212/2020. Informed consent was obtained from all study participants. Information regarding the purpose of the study, voluntary nature of participation, and risk imposed due to involvement presented in the information section of the survey. The survey questionnaire designed in a way the study participants only directed to the survey questions following a respondent click on a response button "Agree to participate" after reading the consent information. To ensure anonymity, information identifying the participants not included in the survey.

Furthermore, the data files stored on a password-protected computer.

Acknowledgments

The authors would like to acknowledge Jimma University and the study participants.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agree to be accountable for all aspects of the work.

Funding

The authors did not receive any financial support for the survey work or for publication of the article.

Disclosure

The authors declare that there is no conflict of interest.

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