

Preventive Practice and Associated Factors Among Health Care Workers Towards Covid-19 In Addis Ababa Covid Care Center

Hailu Asmare^{1*}, Melsew Getnet², Wuletaw Chane², Edmialem Getahun², Asaminew Habtamu³, Taye Mezegebu⁴, Kassie Gebeyehu⁵, Melkie Ambaw⁶, Migbar Sibhat⁵

¹School of Nursing, College of Health Science and Medicine, Wolaita Sodo University, Sodo, Ethiopia

²Millennium Covid Care Center, Saint Paul's Hospital Millennium Medical College, Addis Ababa, Ethiopia

³School of Nursing, College of Health Science and Medicine, Jimma University, Jimma, Ethiopia

⁴Schools of Nursing, College of Health Science and Medicine, Wachemo University, Hosanna, Ethiopia

⁵College of Health Science and Medicine, Dilla University, Dilla, Ethiopia

⁶Department of Nursing, Arba Minch College of Health Science, Arba Minch, Ethiopia

Article Info

Received: September 20, 2022

Accepted: September 27, 2022

Published: October 03, 2022

***Corresponding author:** Hailu Asmare Beyene, Affiliation: Wolayta Sodo University, Sodo, Ethiopia.

Citation: Asmare H, Getnet M, Chane W, Getahun E, Habtamu A., (2022) "Preventive Practice and Associated Factors Among Health Care Workers Towards Covid-19 In Addis Ababa Covid Care Center". International Journal of Epidemiology and Public Health Research, 2(3). DOI: <http://doi.org/11.2022/1.1036>.

Copyright: © 2022 Hailu Asmare Beyene. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract:

Background: COVID-19 has made exceptional challenges to public health globally. Healthcare experts who are at the frontline of the outbreak reaction are at increased risk of getting infected. The high infection rate of COVID-19 has been reported amongst frontline health care workers which might be linked to low prevention practice. However, in the context of Ethiopia, studies ascribed to the prevention practice against COVID-19 among healthcare workers are limited. Therefore, this study aimed to assess the Preventive practice against COVID-19 and associated factors among health care workers.

Methods and Materials: Institution-based cross-sectional study design was conducted on 240 healthcare workers at millennium covid care center and a pretested structured questionnaire was used for the data collection. The data was entered into epi data version 4.4.2.2 and exported to SPSS window version 25 for analysis. Descriptive statics and binary logistic regression were used. Odds ratio with a 95% confidence interval and p-value ≤ 0.05 were quantified to measure effect sizes of independent variables and to declare statistical significance respectively.

Result: This study showed that 55% of health care workers have good preventive practice and In line with this, lack of personal protective equipment(AOR=2.978, 95%CI(1.426-6.220)), designed isolation area (AOR=2.251, 95%CI(1.056-4.799)), availability of chemical disinfectant (AOR=5.055, 95%CI (2.283-11.191)), training on covid case management(AOR=6.04, 95%CI(2.569-14.204)), infection prevention guideline availability (AOR=2.59, 95%CI(1.192-5.627)), and discomfort while using PPE (AOR=4.125 95%CI (1.779-9.561)) showed significant association with the preventive practice of frontline health care workers towards covid 19.

Conclusion: The overall finding of this study revealed that healthcare workers had poor preventive practice (45%) towards covid 19. Lack of personal protective equipment, designed isolation area, lack of disinfectant, training on covid case management, infection prevention guideline availability, and discomfort while using PPE were independently associated with the preventive practice of health care workers towards covid 19. Addressing these identified factors will enable to reduce the infection rate among health care providers.

Keywords: covid 19; prevention practice; factors; frontline; Ethiopia

Introduction

Coronavirus disease (COVID-19) is an infectious disease caused by a virus, officially known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)(1). The World Health Organization (WHO) declared the coronavirus 2019 (COVID-19) as a pandemic on 11 March 2020, after 11 days of being declared as a public health emergency. COVID-19 was reported as a continuing global epidemic since it occurs in December 2019 in Wuhan City, China(2,3).

COVID-19 is featured by rapid transmission via respiratory droplets and near contact



with an infected individual while sneezing and coughing. The common symptoms of COVID 19 have been recognized as fever, dry cough, fatigue, myalgia, shortness of breath, and dyspnea (3,4).

Infection control measures to decrease the means of transmission of COVID-19 include universal source control, early identification, and isolation of patients with suspected infection, use of appropriate Personal protective equipment in the working unit, and environmental cleansing within the health care settings (5).

COVID-19 infection has outreached all over the world where the total affirmed a number of cases is more than 172 million and over 3 million deaths have been reported globally due to COVID-19 until Jun 8, 2021. Africa is the final landmass to be hit by this pandemic; and around 3,563 825 cases and 88274 deaths were reported until Jun 8, 2021. Ethiopia has become one of the influenced nations as of March 13, 2020, the date on which one imported case was first identified. According to the World health organization (WHO), the number of affirmed cases in Ethiopia reached 272 805 cases and 4, 201 deaths as of June 8, 2021 report (6).

COVID-19 has a devastating impact on social, financial, and political crises that will cause profound scars on casualties of the virus. Poor infection prevention practice among health care providers will cause a challenge in the supportive treatment, and it enhances the widespread of the pandemic (7).

Healthcare workers (HCWs) have been confronting serious work-related health risks when involving caring for COVID-19 patients and testing suspected cases, especially during the early stage of the pandemic. They are at a high chance of COVID-19 infection since they are not only regularly exposed to infected people with inadequate isolation facilities and inadequate personal protective equipment, but also they are working under a high load for long hours being fatigued and trouble.

Controlling and preventing the spread of COVID-19 in health facilities becomes a top priority as the spread will get out of control if HCWs also become patients. Poor practices of HCWs can result in delayed diagnosis, inaccurate treatment, and increment the chance of infection transmission in other patients, HCWs, and visitors. Evidence shows that proper infection prevention and control (IPC) measures during outbreak management could change the course of the outbreak (8).

Since Health care workers are at the frontline of COVID-19 control and prevention, they are at higher risk for COVID-19 infection. To the best literature search, few studies were conducted on the level of infection prevention practice of healthcare workers. Thus, this study aimed to assess the level of infection prevention practices and associated factors towards COVID-19.

Methods and materials

A cross-sectional study design was conducted to assess the preventive practice and associated factors against covid-19 among health care workers of Millennium Covid Care center in Addis Ababa. The target population of the study includes all healthcare

workers actively working at MCCC. Participants were selected randomly using the human resource workers registered list. The sample size of the study was determined with single population proportion formula. Following this, a 95% confidence level, a 5% tolerable error a 50% postulated variability of preventive practice were assumed. As well, since the total healthcare workers in the setting were less than 10,000 population reduction formula was used. As a result, the total sample size of the study was 240.

In measuring the brand variable of the study, **practice**: the level of preventive practice among health care workers was assessed using a 12 item containing a standardized questionnaire. In the same vein, health care workers with a preventive practice score of >8.6 were categorized under a good level of practice, and less than the aforementioned cutoffs of a score as under poor practice level

Data collection tools and procedure

Pretested self-administered questionnaire which is adopted from different reviewed literature with some modifications was used (4). It contained three sections, sociodemographic characteristics of the participant which contains seven questions, questions assessing the level of preventive practice that has twelve questions, and questions assessing associated factors of preventive practice contained 15 questions. Data collectors were approaching the participants politely and respectfully and the questionnaire was distributed to randomly selected health care workers. The supervisors were monitoring the data collection process of the data collectors and if any problem happens they were trying to solve or contact the principal investigators.

Data quality control

Six BSc nurse data collectors and two MSc supervisors were recruited for data collection. Half-day training was given to the data collectors and supervisors. One week before the actual data collection, a pre-test was conducted on 5% of the samples in St.pauls hospital covid care center. Each questionnaire was checked for completeness, missed values, and unlikely responses. Those incomplete questionnaires were omitted from the analysis. The principal investigator was making spot-checking and reviewing the completed questionnaires to ensure completeness and consistency of the information.

Data processing and analysis

Data were coded and entered into the computer using Epi data version 4.4.2.2. Then data was exported to windows of Statistical Package for Social Science (SPSS) version 25 for data analysis. During the process of analysis, descriptive statistics were used to provide an overall and coherent presentation and description of the data.

Binary logistic regression was done to measure the overall statistical significance and effect size of individual independent variables with dependent variables. As a result, variables with a P-value of ≤ 0.25 during the bivariate analysis were entered into a multivariable logistic regression to control potential confounders. After adjustment, Inorder to dictate effect size and statistical significance of associations of independent variables with the outcome variable, AOR with 95% confidence level and p-values were computed respectively. In the meantime, variables with a p-



value of <0.05 were declared to be significantly associated with the outcome variable of the study.

In the process, ethical issues related to sampling and data collection were considered. Thus before project implementation, ethical clearance was obtained from the IRB of St.pauls Millennium medical college and subsequent permission was obtained from Millennium covid care center research development office.

Results

Socio-demographic characteristics

A total of 240 participants were involved in the study, of which, more than three-fourths (67%) were males. The mean age of the study participants was 29 years (SD=4.4). On the other hand, 179 (75%) participants were nurses. Moreover, 137 (57%) study subjects had a BSc degree. One-hundred and fifty-one (63%) participants had less than five years of work experience (Table 1).

Table1: Sociodemographic characteristics of study participants

No	Variables		Frequency	Percent (%)
1.	Age	20-30	167	70
		>30	73	30
2.	Sex	Male	160	66.7
		Female	80	32.3
3	marital status	single	120	50.0
		married	114	47.5
		divorced	6	2.5
4	educational status	Diploma	61	25.4
		BSC	137	57.1
		MSC	42	17.5
5	Profession	Nurse	179	74.6
		Doctor	23	9.6
		laboratory	16	6.7
		pharmacy	15	6.3
		health officer	7	2.9
6	Year of experience	<5yrs	151	62.9
		5-10	75	31.3
		10-15	14	5.8

Institutional and healthcare provider related factors

The study finding showed that 107 (44.6%) healthcare workers respond as there is no adequate PPE. More than three-fourths healthcare workers did not take COVID-19 case management training. Moreover, 83 (34.6%) of HCWs have no disinfectant access and only 65 (27.1%) use social media as a source of information. Besides, 151 (62.9%) of HCWs did not use a mobile phone and other personal materials while on work (Table 2).

Table 2: level Preventive practice of health care workers towards covid 19

	Yes		No	
	N	%	N	%
do you wash your hands	205	85.4	35	14.6
do you regularly use facemask at the point of care	201	83.8	39	16.3
do you use a facemask when you have flu-like symptoms	202	84.2	38	15.8
do you use non-conventional remedies	140	58.3	100	41.7
in recent times, have you worn a face mask when leaving your home	185	77.1	55	22.9
do you wash hands before donning	164	68.3	76	31.7
do you were facemask in a gown dressing room	174	72.5	66	27.5
do you change gloves after the procedure	170	70.8	70	29.2
do you apply PPE while caring for the patient	174	72.5	66	27.5
do you avoid unnecessary close contact and practice social distance	127	52.9	113	47.1
do you keep yourself warm and hydrated	133	55.4	106	44.2
do you avoid close contact with people having flu-like symptoms	179	74.6	61	25.4

The preventive practice of health care workers toward covid 19

Of all participating health care workers, 108 (45.0%) had poor preventive practice, while 132 (55.0%) had good preventive practice towards COVID-19. The study result also revealed that 85.4% and 83.1% of the study subjects wash their hands and use face mask at the point of care respectively. One-hundred-forty (58.3%) health care workers use non-conventional remedies when they have flu-like symptoms. Furthermore, 66 (27.5%) of participants do not apply full PPE while providing care, and 113 (47.1%) do not avoid unnecessary contact (practice social distance) (Table 3).

**Table 3: Frequency distribution of factors associated with the preventive practice of covid 19**

	Yes		No	
	N	%	N	%
Are there adequate PPE	133	55.4	107	44.6
Functional wash service	131	54.6	109	45.4
Are there a designed area	153	63.7	87	36.3
Disinfectant access	157	65.4	83	34.6
proper doffing unit	73	30.4	167	69.6
are there rapid tests and management for those who have contact with a covid patient	174	72.5	66	27.5
Had training on doffing and donning	178	74.2	62	25.8
Received training on covid case management	88	36.7	152	63.3
Using social media as a source of information	65	27.1	175	72.9
IP guideline availability	174	72.5	66	27.5
Workload lower IP practice	172	71.7	68	28.3
Discomfort while using PPE	171	71.3	69	28.7
drink alcohol	145	60.4	95	39.6
Don't use a mobile phone and other materials in the working unit	151	62.9	89	37.1
Living with family	162	67.5	78	32.5

Factors associated with the preventive practice of HCWs toward COVID-19

Binary logistic regression was done to measure the overall statistical significance and effect size of individual independent variables with the dependent variables. As a result, variables with a P-value of ≤ 0.25 during the bivariate analysis were entered into a multivariable logistic regression to control potential confounders. In bivariate logistic regression analysis, age, sex, lack of adequate PPE, access to disinfectants, training on donning and doffing, lack of designed isolated area, lack of IP guideline, training on covid case management, discomfort while using PPE, and use of social media as a source of information had a P-value of < 0.25 , and transferred to the final model for confounder adjustment.

Afterward, in multivariate logistic regression analysis lack of adequate PPE, designed isolated area, lack of disinfectant, training on covid case management, IP guidelines availability, and discomfort while using PPE have significantly associated with the preventive practice of health care workers towards COVID-19 (Table 4).

Table 4: factors associated with preventive practice to COVID-19 among HCWs

Variables		Nurses practice level		Crude OR (CI)	Adjusted OR (CI)	P-value
		Poor	Good			
Sex	male	64	96	1.00	1.00	
	female	44	36	0.55 (0.32-0.94)	0.54 (0.26-1.15)	.111
Adequate PPE	No	70	37	1.00	1.00	
	yes	38	95	4.73 (2.73, 8.18)	2.98(1.43-6.22)*	.004
Designed isolation area	No	50	37	1.00	1.00	
	Yes	58	95	2.21 (1.30-3.79)	2.25(1.06-4.80)*	.036
Disinfectant access	No	60	31	1.00	1.00	
	Yes	48	109	5.92(3.29-10.67)	5.05 (2.28-11.19)*	.000
Received training on covid case management	No	82	70	1.00	1.00	
	Yes	26	62	2.79 (1.60-4.89)	6.04 (2.57-14.20)*	<.001
IP guideline availability	No	42	24	1.00	1.00	
	Yes	66	108	2.86 (1.59-5.15)	2.59 (1.19-5.63)*	.016
Discomfort while using PPE	No	38	31	1.00	1.00	
	Yes	70	111	1.77 (1.01-3.11)	4.12 (1.78-9.56)*	.001
Use of social media as a source of information	No	72	103	1.00	1.00	
	yes	36	29	0.56(.317-1.00)	0.70(0.30-1.59)	.391

The odds of COVID-19 preventive practice were tripled among HCWs with adequate PPE access compared to their counterparts. ($p=0.004$, AOR=2.978 CI (1.43-6.22)). Likewise, those HCWs who had designed isolation rooms were two times more likely to have good preventive practice than their counterparts ($p=0.036$, AOR=2.251 CI (1.056-4.799)). The odds of COVID-19 preventive practice among HCWs who had disinfectant access were five times ($p=0.000$, AOR=5.055 CI (2.283-11.191)) higher than those who have lack of disinfectant access. HCWs who received covid case management training were six times more likely to have good practice than those who don't have taken ($p=0.000$, AOR=6.04 CI (2.569-14.204)). Furthermore, HCWs that have IP guideline is nearly three times more likely to have good prevention practice than those who don't have IP guideline ($p=0.016$) AOR=2.59 CI(1.192-5.627). HCWs who feel discomfort while using PPE ($p=0.001$, AOR=4.125 CI (1.779-9.561)) were four times more likely to have a good practice.

Discussion

Coronavirus disease-2019 has made exceptional challenges to public health. Healthcare experts who are at the frontline of the outbreak reaction are at a higher chance of exposure and enduring the infection. The low prevention practice toward COVID-19 among HCWs can lead to improper reaction and a high chance of infection. Hence, this study aimed at determining the level of preventive practice and identification of factor associated with it.



In this study, the level of preventive practice was 55% (95% CI: 48.5, 61.4), which was relatively similar to the study done in Deberetabor hospital (49%)(9). This consistency can be due to the similar study subject and study design. However, it was lower than the findings of the studies done in Vietnam (83.1%), Pakistan (73.4%), Zambia (75%), Nigeria 68.4%, and Amhara regional hospital 62% (7)(10)(11) (12) (13). This discrepancy can be due to the difference in the economic development between these countries (Vietnam and Pakistan)(11,13), which can influence the access to PPE and prevention measures. Additionally, our study area provides more extensive care for a huge number of critical patients compared to the regional covid care centers like in Amhara regional hospitals (10). This can be also due to difference in study subjects, where the Zambian study included only laboratory staff (12).

Conversely, the finding of this study is higher than the study done in Lebanon 35 % (14). This can be due to the study subject difference in the study population, where the study in Lebanon only includes dentists (doctors only). It is also higher than the study done in Gamo zone Ethiopia 35.3 % (15). This is due to the higher sample size in this study.

HCWs who had adequate PPE access are almost three times ($p=0.004$, AOR=2.978 CI (1.43-6.22)) more likely to have good preventive practice than those who don't have adequate PPE. Similarly, the odds of good practice among HCWs who had disinfectant access were five times ($p=0.000$, AOR=5.055 CI (2.283-11.191)) higher than those who have lack of disinfectant access. This finding was supported by the study conducted in seven public hospitals in western Ethiopia and Amhara regional hospital (16)(10). Having adequate access to disinfectants and other PPE helps HCWs to use without any restriction; therefore they could have good preventive practice than their counterparts. This is because disinfectants and sanitizers are essential preventive agents against coronavirus disease (17).

Likewise, those HCWS who had designed isolation rooms were two times more likely to have good preventive practice than their counterparts ($p=0.036$, AOR=2.251 CI (1.056-4.799)). The possible justification might be, having isolation rooms help to reduce the risk of aerosolization and droplet transmission when suspected or confirmed COVID-19 cases are detected among the HCWs.

HCWs who received covid case management training were six times more likely to have good practice than those who didn't take it ($p=0.000$, AOR=6.04 CI (2.569-14.204)), which is supported by the study conducted in western Ethiopia, a study in Zambia and Amhara regional hospitals (10,12,16). Since COVID-19 is a new disease with no well understood pathogenesis, COVID case management training can boost the knowledge of health care workers and, thus, improve the level of preventive practice (18). HCWs that have IP guidelines in their working unit is nearly three times more likely to have good prevention practice than those who don't have IP guidelines ($p=0.016$, AOR=2.59 CI (1.192-5.627)). This finding is supported by a study in Amhara regional hospital. Since IP guideline aims to provide users with the latest evidence-based recommendations for infection prevention and control in the context of COVID-19 in health care and community settings. So that those HCWs who have access to IP guideline can have good prevention practice than those who don't have(19).

HCWs who feel discomfort while using PPE ($p=0.001$, AOR=4.125 CI (1.779-9.561)) were four times more likely to have a good preventive practice. This may imply that participants who feel discomfort while using PPE were applying preventive protocols and PPEs for a long period of time and persistently. Reports also supported this evidence in which prolonged use of PPEs is associated with physical adverse effects such as headache, dyspnea, acne, skin breakdown, allergic reaction, and dehydration(20).

The use self-administered questionnaire to collect the data is the main limitation of the study since it may be exposed to social-desirability bias.

Conclusion

The overall result of the study showed that the level of preventive practice among health care workers towards COVID-19 is too far below the level of what it has to be. Lack of adequate PPE, designed isolated area, lack of disinfectant, training on covid case management, IP guidelines availability, and discomfort while using PPE were independently associated with the preventive practice of health care workers towards COVID-19.

Ethics approval and consent

Ethical approval was obtained from the IRB of St. Paul's millennium medical college and permission was taken from millennium covid care center research coordinator and written consent was taken from study participants before data collection and confidentiality of the information was ensured by coding and anonymity was kept.

Abbreviations: Health care workers (HCWs), Millennium covid care center (MCCC)

Confidence interval (CI), Personal protective equipment (PPE), Odds ratio (OR), statically package for social science (SPSS), World health organization (WHO).

Acknowledgment

We would like to thank millennium covid care center for giving chance to carry out this research and for all data collectors and participants.

Author contribution

HAB generated the concept and wrote the proposal after being approved by MGT and WCZ. MGT, MSM, HAB designed the study and formulated the tool. was involved in the conception, design, analysis, interpretation, report, and manuscript writing. WCZ, EGM, TMA, AHS, KGT, and MAM participated in the data collection and entry as well as cleaning. Then, MGT, HAB & MSM performed statistical analysis and HAB wrote the first draft of the manuscript. MGT & MSM edited and formatted the manuscript for publication. Finally, all the authors read, critically revised and approved the final version of the manuscript as well as agreed to be equally responsible for any aspect of this manuscript.



Funding: The authors received no specific funding for this work.

Competing interests: The authors declare that they have no conflicts of interest

Consent for publication: Not applicable

Availability of supporting data: All data supporting the study is available with the reasonable request

References

- Alreshidi NM, Haridi H, Alaseeri R, Garcia M, Gaspar F, Alrashidi L. Assessing healthcare workers' knowledge, emotions and perceived institutional preparedness about COVID-19 pandemic at Saudi hospitals in the early phase of the pandemic. *J Public Health Res* [Internet]. 2020 Nov 3 [cited 2021 Jun 16];9(4).
- Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Trop Med Health* [Internet]. 2020 Dec [cited 2021 Jun 6];48(1):72.
- Jemal B, Ferede ZA, Mola S, Hailu S, Abiy S, Wolde GD, et al. Knowledge, attitude and practice of healthcare workers towards COVID-19 and its prevention in Ethiopia: a multicenter study [Internet]. In Review; 2020 May [cited 2021 Jun 7].
- Kanu S, James PB, Bah AJ, Kabba JA, Kamara MS, Williams CEE, et al. Healthcare Workers' Knowledge, Attitude, Practice and Perceived Health Facility Preparedness Regarding COVID-19 in Sierra Leone. *J Multidiscip Healthc* [Internet]. 2021 Jan 11 [cited 2021 Jun 16];14:67–80.
- Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, et al. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *J Hosp Infect* [Internet]. 2020 Jun 1 [cited 2021 Jun 7];105(2):183–7.
- Zeenny RM, Ramia E, Akiki Y, Hallit S, Salameh P. Assessing knowledge, attitude, practice, and preparedness of hospital pharmacists in Lebanon towards COVID-19 pandemic: a cross-sectional study. *J Pharm Policy Pract* [Internet]. 2020 Dec [cited 2021 Jun 16];13(1):54.
- Oche OM, Adamu H, Yahaya M, Raji IA, Illo HG, Kontagora ZA, et al. Knowledge, Attitude and Practices Related to COVID-19 Prevention among Health Care Workers in Sokoto Metropolis, Nigeria. *Int J Trop Dis Health* [Internet]. 2020 Dec 31 [cited 2021 Jun 7];44–61.
- Shakeel S, Rehman H, Hassali MA, Hashmi F. Knowledge, attitude and precautionary practices towards COVID-19 among healthcare professionals in Karachi, Pakistan. *J Infect Dev Ctries* [Internet]. 2020 Oct 31 [cited 2021 Jun 16];14(10):1117–24.
- Emiru TD, Birlie TA, Tasew SF, Amare AT, Tibebe NS, Tiruneh CM. Assessment of knowledge, practice and associated factors towards prevention of novel corona virus among clients attending at Debre Tabor General Hospital, Debre Tabor Town, North West Ethiopia, 2020: Institutional based cross-sectional study. *J Community Med Health Solut* [Internet]. 2020 Dec 7 [cited 2021 Jun 7];1(1):026–34.
- Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. *Trop Med Health* [Internet]. 2020 Dec [cited 2021 Jun 6];48(1):72.
- Tien TQ, Tuyet-Hanh TT, Linh TNQ, Phuc HH, Nhu HV. Knowledge, Attitudes, and Practices Regarding COVID-19 prevention among Vietnamese Healthcare Workers in 2020: Health Serv Insights [Internet]. 2021 May 25 [cited 2021 Jun 7];
- Chawe A, Mfuno RL, Syapiila PM, Zimba SD, Vlahakis PA, Mwale S, et al. Knowledge, attitude and practices of COVID-19 among medical laboratory professionals in Zambia. *Afr J Lab Med* [Internet]. 2021 Mar 4 [cited 2021 Jun 7];10(1):7.
- Salman M, Mustafa Z, Asif N, Zaidi HA, Shehzadi N, Khan TM, et al. Knowledge, attitude and preventive practices related to COVID-19 among health professionals of Punjab province of Pakistan. *J Infect Dev Ctries* [Internet]. 2020 [cited 2022 Feb 25];707–12.
- Hleyhel M, Haddad C, Haidar N, Charbachy M, Saleh N. Determinants of knowledge and prevention measures towards COVID-19 pandemic among Lebanese dentists: a cross sectional survey. *BMC Oral Health* [Internet]. 2021 Dec [cited 2021 Jun 7];21(1):1–9.
- Mersha A, Shibiru S, Girma M, Ayele G, Bante A, Kassa M, et al. Perceived barriers to the practice of preventive measures for COVID-19 pandemic among health professionals in public health facilities of the Gamo zone, southern Ethiopia: a phenomenological study. *BMC Public Health* [Internet]. 2021 Dec [cited 2021 Jun 7];21(1):1–10.
- Etafa W, Gadisa G, Jabessa S, Takele T. Healthcare workers' compliance and its potential determinants to prevent COVID-19 in public hospitals in Western Ethiopia. *BMC Infect Dis* [Internet]. 2021 May 19 [cited 2021 Jun 7];21(1):454.
- Dhama K, Patel SK, Kumar R, Masand R, Rana J, Yattoo Mohd I, et al. The role of disinfectants and sanitizers during COVID-19 pandemic: advantages and deleterious effects on humans and the environment. *Environ Sci Pollut Res Int* [Internet]. 2021 [cited 2022 Mar 12];28(26):34211–28.
- COVID-19 Worker Training Resources [Internet]. National Institute of Environmental Health Sciences. [cited 2022 Mar 12].
- WHO-2019-nCoV-ipc-guideline-2022.1-eng.pdf [Internet]. [cited 2022 Mar 12].
- Elisheva R. Adverse Effects of Prolonged Mask Use among Healthcare Professionals during COVID-19. *J Infect Dis Epidemiol* [Internet]. 2020 Jun 1 [cited 2022 Mar 31];6(3).