

# Health and Safety Status of Health Professionals and Associated Factors During Covid-19 Pandemic in Public Hospitals, Addis Ababa, Ethiopia

Bedasa Gidisa (✉ [simbookoo127@gmail.com](mailto:simbookoo127@gmail.com))

Ethiopian Public Health Institute, Addis Ababa

Hanna Feleke

Saint Paul's Hospital Millennium Medical College, Addis Ababa

Bezatu Mengistie

Saint Paul's Hospital Millennium Medical College, Addis Ababa

---

## Research Article

**Keywords:** occupational health and safety, infection prevention, COVID-19, healthcare professional

**Posted Date:** March 16th, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-1434319/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

# Abstract

## Introduction:

Healthcare professionals around the world are at risk of contracting an infectious disease. The Corona Virus Disease 19 epidemic has had a profound effect, especially on hospitals and health workers. However, at the national level in Ethiopia, there is a lack of data on the current state of health and safety of health care professionals. Therefore, the purpose of this study was to determine the state of health and safety and the associated characteristics of health professionals in public hospitals during the COVID-19 epidemic.

## Objective

The purpose of this study was to determine the occupational health and safety of health professionals and associated factors, at selected public hospitals in Addis Ababa during the Corona Virus Disease 19 pandemic.

## Methodology:

An institutional based cross-sectional study was conducted From January 1 to January 30, 2022, for 360 participants. A simple random technique was used to select study participants. Data were collected using self-administered questioners and entered into Epi info version 3.1 before being exported to SPSS Software (version 23) for analysis. Logistic regression was used to identify significant variables and control confounding factor. The strength of the association was measured using an adjusted odds ratio with a 95 percent confidence interval at a 5% level of significance. A P-value < 0.05 indicated a significant relationship between factors.

## Result

Out of a total of 360 study participants, 73.6% (95%Confidence Interval [CI] = 68.9–78.3) had good occupational health and safety status. Work experiences(Adjusted Odds Ratio [AOR] = 1.8, 95%Confidence Interval[CI] = 1.12–3.2), Availability of Proper facemasks to wear during patient contact (Adjusted Odds Ratio [AOR] = 3, 95%Confidence Interval[CI]: 1.7–5.2), the presence of cleaning and disinfection agents (Adjusted Odds Ratio [AOR] = 2, 95%Confidence Interval[CI] = 1.11–3.7), availability of water and hand washing facilities (Adjusted Odds Ratio [AOR] = 2, 95%Confidence Interval[CI] = 1.1–3.4), training on health and safety (Adjusted Odds Ratio [AOR] = 1.8, 95%Confidence Interval[CI] = 1.13–3.2) were significantly associated with occupational health and safety status of health professionals. Conclusion: The findings indicated that occupational health safety status was generally good in the study area. However, the availability of personal protective equipment, availability of water and hand washing facilities, availability of cleaning and disinfectants, and the provision of health and safety training for health professionals still need to be improved because lack of these predictors decrease occupational health and safety status of health professionals and increase the risk of infections at work place.

## Introduction

Healthcare professionals (HCPs) around the world are at risk of contracting infectious diseases during work[1]. COVID-19 has underlined this concern, particularly in the early stages of the pandemic, when many health care

facilities lack personal protective equipment (PPE)[2]. HCPs continue to offer patient care in various situations around the world, even if they are afraid of becoming infected and infecting their family, friends, patients, and coworkers [3–5].

Because African countries, including Ethiopia, have limited health care facilities and lack individual protection equipment to prevent the pandemic, the stress of COVID 19 risks for health professionals in Africa is significant[2, 6]. SARS-CoV-2 infection is more likely in healthcare workers that work close to proximity to patients, such as ophthalmologists and dentists [7].

While people are encouraged to stay at home to prevent the diseases from spreading, healthcare workers must keep working even though of the fact that their lengthy shifts expose them to infection. Many hospitals report mental and physical stress, as well as difficulty handling so many sick patients, an increase in mortality in general, and the deaths of their colleagues[5, 8, 9]

Little is said about the occupational health and safety of health professionals in Ethiopia, particularly in Addis Ababa. The busiest hospitals in the country are Saint Paul's Hospital Millennium Medical College and Ras Desta Memorial Hospital, which both act as referral hospitals. The occupational health and safety of health professionals, OHS risks, control measures, and safety practices of health professionals should be assessed during this COVID 19 pandemic in selected public hospitals, Addis Ababa, Ethiopia.

As a result, the goal of this study was to determine occupational health and safety status and associated factors in selected public hospitals, during COVID 19 Pandemic.

## **Methods And Materials**

### **4.1. Study Design and Period**

An institutional based cross-sectional study was undertaken from January 1 to January 30, 2022.

### **4.2. Study Setting**

The study settings were Ras Desta Memorial Hospital and Saint Paul's Hospital Millennium Medical College, which are Public Referral Hospitals found in Addis Ababa, Ethiopia. Therefore the research was carried out among health professionals in selected Hospitals

The Ras Desta Damtew Memorial Hospital found under the Addis Ababa City Administration, and the hospital currently features a medical facility that provides health care services to both inpatients and outpatients. Currently, the hospital employs roughly 560 people, with 425 of them being health professionals, including 226 nurses, 88 doctors, and 5 pharmacists.

Saint Paul's Hospital Millennium Medical College is an Addis Ababa-based referral hospital run by the Ethiopian Federal Ministry of Health. Saint Paul's Hospital Millennium Medical College is a teaching health institution as well as a health care provider. The hospital currently has 932 beds and treats 2310 new and 4065 return patients per month on average. It has 2045 health professionals.

### **4.1. Source of Population**

Source of population were all health professionals working at Ras Desta Memorial Hospital and Saint Paul's Hospitals Millennium Medical College in Addis Ababa during data collection.

## 4.2. Study Population

Study participants were health professionals who were selected by using a simple random sampling technique based on the proportion of each hospital's owner.

## 4.3. Inclusion and Exclusion Criteria

### 4.3.1. Inclusion Criteria

During the data collection period, health professionals working at Ras Desta Memorial Hospital and Saint Paul's Hospitals Millennium Medical College were included.

### 4.3.2. Exclusion Criteria

Health professionals on annual leave as well as those who did not wish to take part in the study were also excluded.

## 4.4. Sample Size Determination and Sampling procedure

### 4.4.1. Sample Size Determination

The sample size was derived using a single population proportion formula and a 51 percent proportion of health professional occupational health and safety practice taken from a previous study [4]. Considering 95% confidence interval and 5% marginal error with a 10% non- response rate, the calculated sample size was 384.

If the total population of both hospitals is less than 10, 000, correction formula will be considered.

Correction formula= $\frac{n}{1 + \frac{n}{N}}$  where n=sample size and N=Total health workers of the two hospitals. Therefore, the

smallest sample size needed was calculated by using correction formula  $\frac{n}{1 + \frac{n}{N}} = \frac{384}{1 + \frac{384}{2470}} = 332$ . By adding 10% non-response rate required sample size will be 366.

To determine the sample size for each hospital, we multiplied the number of health professionals employed by the total sample size and divide by the total number of health professionals employed by the two hospitals. i.e:  $N_1 =$  Number of health professional from Ras Desta Hospital = **425**,  $n_1$  will be **63**. And  $N_2 =$  Number of health professional from Saint Paul Hospital = **2045**, and  $n_2$  will be **303**, (where  $N_T = 2470$ ).

### 4.2.1. Dependent variables

Occupational health safety status of the health professionals

### 4.2.2. Independent variables

The independent variables were: Age, sex, educational level, religion, monthly income, job experience, marital status, profession, family size, working section; Accessibility of supplies, such as PPE, like gloves, masks, eyes/face shield, gown, water and hand washing facilities, policy and procedures for infection prevention,

Reducing the number of individuals who enter the room, minimizing the number of individuals who are present in the room, isolating suspected cases separately, and using engineering control to keep healthcare employees away from customers, COVID 19 vaccine availability, accessibility of cleaning and disinfection agents.

## **4.3. Operational Definitions**

### **Occupational Health and Safety**

Occupational safety and health, according to WHO (1995), is defined as "activity designed to safeguard and maintain the health and safety of health care professionals by eliminating occupational factors and conditions that are detrimental to their health and safety at HCF. It is complete physical, mental, and social well-being, of health professionals[10].

Participants' OHS status issues were assessed in this study using 16 questions (health and safety practices questions), each with an equal weighting. Each participant has received a maximum of 16 points and a minimum of 0 points. Finally, the results of each question were divided into two categories based on their OHS status. In this study the participant's OHS issues were assessed 16 questions and assessment items ranged from 0–16, and a score of  $\geq 13$  was reported as good OHS, and a score of  $< 13$  indicated as poor OHS status of health professionals during COVID-19 as Ozturk,et.al; shibiru S. et. al; and Saqlain M.et.al categorization [11–13].

### **4.4. Data collection procedures (Instrument, personnel, data quality control)**

Structured self-administered and interviewer administered questionnaires were used to collect data. Various works of literature were adapted and modified to create the data collection tools[3, 4]. The questionnaire was written in English and then translated into Amharic and back to English to ensure uniformity. For data collection and supervision, three environmental health specialists were chosen: two for data collection and one for supervision. Data collectors and supervisors received one day of training on the study's objectives, the contents of the questionnaire, confidentiality, respondents' rights, and the way to collect data. A pretest of the data collection instrument was undertaken in 10% of the sample in Zawuditu hospital. Data collectors and supervisors discussed the questionnaire to determine the reliability of the data collection instruments and conclusions, and the tool was updated for any inconsistencies or ambiguity before actual data collection. A simple random sampling strategy was used to pick study participants from each public hospital.

### **4.5. Data processing and analysis**

Data were collected, checked for completeness, coded, cleaned, and entered into EP-info software before being transferred to SPSS version 23 for data cleaning and analysis. Frequency tables, cross-tabulations, and proportions were produced as descriptive statistics. Before starting the regression analysis, the Hosmer-Lemeshow goodness of fit test was used to ensure that the model was fit. To discover variables associated with HCPs' OHS, Bivariable, and multivariable logistic regression analyses were used. To control the confounding impact and assess the relationship between the predictors and the outcome (OHS status) of health professionals, all variables with a p-value of  $< 0.2$  in the Bivariable analysis were included in the multivariable model. Significant components in the multivariable model were variables with a p-value of  $< 0.05$ . The odds ratio with a 95% CI was used to describe associations between study variables and outcome factors

## Result

### 1) Socio-demographic of study participants

A total of 360 people took part in the study, with a response rate of 98.4%. Males made up 54.7% of study participants, while females made up 45.3%. Those between the ages of 18–30 years constituted the majority, 219 (60.8%) and only 139 (38.1%) were between age 31–40 years. Almost all of the study participants (65.3%) had more than five years of job experience, and the majority of them (70%) had a bachelor's degree, a master's degree and above (21.1%). In terms of the study participants' occupations, the majorities (35.1%) were nurses and (31.4%) were doctors (Table 1).

Table 1

Socio-Demographic Characteristic and OHS status of Health Professionals at Ras Dasta Memorial Hospital and Saint Paul's Hospitals Millennium Medical College, AA, (n = 360)

Variables	Category	OHS Status of health professionals		
		Poor Practice	Good Practice	Total
		Freq. (%)	Freq. (%)	Freq. (%)
Age	18–30	67 (70.5)	154 (58)	211 (58.6)
	>31	28 (29.5)	111 (42)	139 (41.4)
Sex	Female	46 (48.4)	117 (44.2)	163 (45.3)
	Male	49 (51.6)	148 (55.8)	197 (54.7)
Religion	Orthodox Protestant	55 (57.9)	151 (57)	206 (57.2)
	Muslim	18 (18.9)	50 (18.9)	68 (18.9)
	Others	18 (18.9)	59 (22.3)	77 (21.4)
		4 (4.3)	5 (1.8)	9 (2.5)
Educational level	Diploma BSc Degree Masters and above	3 (3.2)	11(4.2)	14 (3.9)
		76 (80)	194 (73.2)	270 (75)
		16 (16.8)	60 (22.6)	76 (21.1)
Work experience	< 5years	43 (45.2)	82 (31)	125 (34.3)
	> 5years	52(54.8)	183(69)	235 (65.7)
Profession	HO	3 (3.2)	9 (3.4)	12 (3.3)
	Labratorists	9 (9.5)	8 (3.2)	17 (4.7)
	Pharmacists	9 (9.5)	13 (4.9)	22 (6.1)
	Mid wives	16 (16.8)	54 (20.4)	70 (19.4)
	Nurse	28 (29.5)	98 (37)	126 (35)
	MD	30 (31.6)	83 (31.4)	113 (31.4)
Working hours/d	< 8hrs	49 (51.6)	130 (49.1)	179 (49.7)
	≥ 8hrs	46 (48.4)	135 (50.9)	181 (50.3)
Monthly income	< 5000birr	18 (18.9)	44 (16.6)	62 (17.2)
	5000-10,000birr	58 (61.1)	169 (63.8)	227 (63.1)
	> 10,000birr	19 (0.2)	52 (19.6)	71 (19.7)

Variables	Category	OHS Status of health professionals		
		Poor Practice	Good Practice	Total
		Freq. (%)	Freq. (%)	Freq. (%)
Work Section	Laboratory	9 (9.5)	8 (3)	17 (4.7)
	Drug store	9 (9.5)	13 (4.9)	22 (6.1)
	ICU	0	17 (6.4)	17 (4.7)
	Surgical Wards	8 (9.3)	15 (5.7)	23 (6.4)
	pediatric	2 (3)	26 (9.8)	28 (7.8)
	OPD	12 (12.6)	20 (7.5)	32 (8.9)
	Gynecology	22 (23)	52 (19.6)	74 (20.6)
	Emergency	20 (21.1)	63 (23.8)	83 (23.1)
	Medical wards	13 (12.3)	51(19.2)	64 (17.8)
Marital status	Single	41 (43.2)	91 (34.3)	132 (36.7)
	Married	54 (56.8)	174 (65.7)	228 (63.3)
Family size	< 3	68 (70.8)	224 (84.5)	292 (81.1)
	≥ 3	27 (29.2)	41 (15.5)	68 (18.9)

## 2) Engineering control, Administrative control and Availability of PPE

Regarding the availability of PPE, most health professionals (80.6%) had availability of face masks, (79.2%) of them had availability of cleaning and disinfectants, and (41.7%) of health professionals had not enough gloves in their working section.

Regarding engineering and administrative control, most of the study participants (81%) of them had said there was engineering control like (ventilation, isolation, and enough spaces between patient and health provider), especially at triage area and 78% of study participants had said there was a policy and procedure for COVID-19 prevention in their hospitals. Only 69% of study participants had got health and safety training regarding COVID 19 prevention (Table 2).

Table 2: Availability of PPE, Administrative and engineering in selected public hospitals, Addis Ababa, Ethiopia (n=360)

Variable	Category	OHS status		
		Poor	Good	Total (%)
<b>Availability of PPE</b>				
Availability of proper face mask to wear during patient contact?	No	30	40	70 (19.4)
	Yes	35	225	290 (80.6)
Availability of enough gloves in your room?	No	50	100	150 (41.7)
	Yes	45	165	210 (58.3)
Availability of eye/face protection (eg, goggles, face shield)?	No	71	152	223 (62)
	Yes	24	113	137 (38)
Availability of cleaning and disinfectants agents around your working area?	No	33	42	75 (20.8)
	Yes	62	223	285 (79.2)
Availability of water and hand washing facility in your working room?	No	39	60	99 (27.5)
	Yes	56	205	261 (72.5)
<b>Administrative and engineering control</b>				
Do you restrict the number of personnel entering the room of a patient?	No	10	10	20 (5.6)
	Yes	85	255	340 (44.4)
Do you minimize the number of staff present when performing aerosol-generating procedures?	No	41	75	116 (32.2)
	Yes	54	190	244 (67.3)
Is it possible isolating suspected cases separately to help prevent transmission?	No	47	104	151 (42)
	Yes	48	161	209 (58)
Is their engineering control to shield healthcare workers from patients, especially at triage area	No	27	41	68 (19)
	Yes	68	224	291 (81)

Does your organization have a policy and procedure for COVID-19 prevention?	No	25	54	79 (22)
	Yes	70	211	281 (78)
Training on health and safety to prevent COVID-19?	No	39	73	112 (31)
	Yes	56	192	284 (69)
Do you vaccinated with COVID 19 Vaccination?	No	2	5	7 (2)
	Yes	93	260	353 (98)

### 3) Health and safety practices of health professionals

Table 3 showed that from the total 360 participants, 73.6% (95% CI: 68.9–78.3) had good OHS status and 26.4% (95% CI: 21.7– 31.1) of them had poor OHS status in this continued COVID-19 Pandemics Regarding to health and safety practices of health professionals those who had performed hand hygiene after removing PPE (88.3%), those who had performed cleaning and disinfection procedures (87.2%) and who performed hand hygiene after patient contact (86.1%) had the highest good OHS status. On the other hand health professionals those who maintained their social distance (52.5%) during this COVID 19 pandemic had lowest OHS status.

**Table 3: Health and safety practices of Health Professionals during the COVID-19 Pandemic in selected public hospitals, Addis Ababa, Ethiopia(n=360)**

Health and safety practices of health professionals	Category	OHS status		
		Poor	Good	Total
		Freq.(%)	Freq.(%)	
Do you wear gloves when you have contact with patients?	No Yes	27 (28.4)	58 (21.9)	85 (23.6)
		68 (71.6)	207 (79.1)	275 (76.4)
Do you wear a proper face mask when you are serving the client?	No Yes	31(32.6)	33 (12.5)	64 (17.8)
		64 (67.4)	232 (87.5)	296 (82.2)
Do you clean and disinfect reusable instruments after each client?	No Yes	42 (44.2)	37 (14)	79 (22)
		53 (55.8)	228 (86)	281 (78)
Do you wash your hand appropriately with water before wearing PPE?	No Yes	40 (42)	47 (17.7)	87 (24.2)
		55 (58)	218 (82.3)	273 (75.8)
Do you perform hand hygiene before contact with the patient?	No Yes	32 (32.9)	49 (18.5)	81(22.5)
		63 (67.1)	216 (81.5)	279 (77.5)
Do you perform hand hygiene after contact with the patient?	No Yes	40 (42)	10 (3.8)	50 (13.9)
		55 (58)	255 (96.2)	310 (86.1)
Do you perform hand hygiene after removing PPE (eg, gloves, gown, and facemask)?	No Yes	27 (28.4)	15 (5.7)	42 (11.7)
		68 (71.6)	250 (94.3)	318 (88.3)
Do you use an alcohol-based hand rub after patient contact (if water is not available in the room)?	No Yes	52 (55.2)	48 (18.2)	100 (27.8)
		43 (44.8)	217 (81.8)	260 (72.2)
Do you change gloves when indicated and performed hand hygiene?	No Yes	28 (28.8)	35 (13.2)	63 (17.5)
		67 (71.2)	230 (86.8)	297 (82.5)
Do you wash your hands before and after performing a procedure?	No Yes	46 (48.4)	23 (8.7)	69 (19.2)
		49 (51.6)	242 (91.3)	291 (80.8)

Do you perform routine cleaning and disinfection procedures?	No	Yes	32 (32.9)	14 (5.2)	46 (12.8)
			63 (67.1)	251 (94.8)	314 (87.2)
Do you differentiate PPE wearing area from PPE removing area?	No	Yes	57 (60)	45 (17)	102 (28.3)
			38 (40)	220 (83)	258 (71.7)
Do you handle waste and other potentially infectious materials properly?	No	Yes	55 (58)	30 (11.3)	85 (23.6)
			40 (42)	235 (89.7)	275 (76.4)
Do you avoid touching your faces, eyes, noses, and mouth before disinfection?	No	Yes	49 (51.6)	34 (12.8)	83 (23)
			46 (48.4)	231(87.2)	277 (77)
Have you been tested for COVID-19?	No	Yes	47 (48.8)	87 (32.8)	134 (37.2)
			48 (51.2)	178 (67.2)	226 (62.8)
Do you maintain social distance during the COVID-19 outbreak?	No	Yes	65 (68.4)	126 (47.5)	191(53.1)
			30 (31.6)	139 (52.5)	269 (46.9)
<b>Total status of OHS of health professionals</b>	<b>Good status</b>			<b>265 (73.6%)</b>	
	<b>Poor status</b>			<b>95 (26.4%)</b>	

## 4) Factors Associated with Occupational Health and Safety status of Health Professionals

In the Bivariable analysis, different independent variables were tested for the presence of association with occupational health and safety of health professionals. As a result of age, work experiences, working section, presence of enough gloves in the working room, having disinfectant, having accessible hand washing facilities, restriction of some personnel entering into the patient room, minimizing the number of staff during aerosol procedures, the possibility of isolation suspected cases, engineering control at triage area, and policy and procedures to prevent COVID19, and health and safety training had an association with OHS status of health professionals at  $p < 0.2$ , and these variables were taken to multivariable analysis.

In multivariable analysis work experiences, availability of face mask, availability of cleaning and disinfectants, availability of water and hand washing accessibility, health and safety training had a significant association with the OHS status of healthcare professionals at  $p < 0.05$

Table 4 showed that healthcare professionals who had more than five years of work experience were about 2 times more likely to have good OHS status than their counterparts (AOR = 1.8, 95% CI: 1.12–3.2).

Availability of PPE (face masks) need to worn during patient contact in the hospitals increases OHS status of healthcare professionals by 3 times (AOR = 3, 95% CI: 1.7–5.2). Or health professionals who had availability of facemasks were 3 times more likely had good OHS status than health professionals who hadn't availability of face masks

Availability of PPE (face masks) that need to be worn during patient contact in the hospitals increases the OHS status of healthcare professionals by 3 times (AOR = 3, 95% CI: 1.7–5.2). Or health professionals who had availability of facemasks were 3 times more likely to have good OHS status than health professionals who hadn't availability of face masks

The other important is cleaning and disinfectant agents which are very important concepts in health care facilities. These agents are one of the control methods of infectious disease transmission. Cleaning and disinfection with these agents among HP and patients is a critical component of safe healthcare delivery in all healthcare settings[14]. According to this study availability of cleaning and disinfection agents in the working section increases the OHS status of HP by 2 times (AOR = 2, 95% CI: 1.11–3.7). In other words, the lack of disinfectants in the hospitals decreases the health and safety status of health professionals by 2 times.

Healthcare professionals who had water and hand washing accessibility in their hospitals were 2 times more likely to have good occupational health and safety than those who didn't have (AOR = 2, 95% CI: 1.1–3.4). This showed that lack of water and hand washing accessibility in hospitals reduces the OHS status of healthcare professionals by 2 times.

Health professionals who had taken orientation, or training on health and safety to prevent COVID-19 were almost 2 times more likely to have good OHS status than the counterpart (AOR = 1.8, 95%CI: 1.13–3.2). Health and safety training is very important in the healthcare setting to prevent infectious diseases so this study revealed that lack of health and safety training for health professionals decreases the OHS status of health professionals by almost 2 times (AOR = 1.8, 95%CI: 1.13–3.2).

Table 4

Factors Associated with Health and Safety among Health Professionals in selected public hospitals, Addis Ababa, Ethiopia (n = 360)

Variables	Characteristics	Osh status		Crude OR(95% CI), P-value	AOR(95% CI), p-value
		Poor	Good		
Age	18–30	67	154	1	—
	> 31	28	111	1.8 (1.1, 3), 0.02	
Work experiences	< 5yrs	43	82	1	<b>1</b>
	> 5yrs	52	183	1.9 (1.1, 2.8), 0.024	<b>1.8 (1.12, 3.2), 0.012</b>
Working section	Laboratory	9	8	1	1
	Drug store	9	13	1.6(0.4, 5.8), 0.4	0.69(0.23,4.1), 0.96
	ICU	0	17		
	S.Wards	8	15	1.5(0.3, 5.2), 0.5	1.25(0.93,5.23), 0.99
	pediatric	2	26	2(0.6, 7.6), 0.25	1.84(0.46,7.42), 0.39
	OPD	12	20	4(1.4, 12), 0.052	3.76(0.98,24), 0.071
	Gyne	22	52	1.9(0.6, 6.7), 0.3	1.6(0.44,5.98), 0.46
	Emergency	20	63		
	M.wards	13	51	2.7(0.9, 7.8), 0.075	2.4(0.75,7.88), 0.14
Availability of Enough gloves in your room?	No	67	148	1	1
	Yes	28	117	1.89(1.15,3.13), 0.013	1.22(0.66,2.27), 0.52
Availability of face mask to wear during patient contact?	No	30	40	1	<b>1</b>
	Yes	35	225	5(2.5, 9.3), 0.008	<b>3(1.7, 5), 0.014</b>
Disinfectants around working area?	No	32	42	1	<b>1</b>
	yes	62	223	2.55(1.49,4.35), 0.001	<b>2(1.11, 3.7), 0.02</b>

Variables	Characteristics	Osh status		Crude OR(95% CI), P-value	AOR(95% CI), p-value
		Poor	Good		
Water and Hand washing accessibility	No	39	60	1	<b>1</b>
	yes	56	205	2.4(1.4, 3.9), 0.001	<b>2 (1.1, 3.4), 0.022</b>
Restriction of personal enter into patient room	No	10	10	1	1
	yes	85	255	3(1.2, 7.5), 0.018	1.6(0.54,4.8), 0.39
minimize the number of staff during aerosol-generating	No	41	75	1	1
	yes	54	190	2(1.2, 3.2), 0.088	1.3(0.64,2.7), 0.46
Engineering control to shield HCP from patients,	No	27	41	1	1
	Yes	68	224	2.2(1.2, 3.8), 0.076	1.3(0.64,2.63), 0.46
Policy and procedure for infection prevention?	No	25	54	1	1
	Yes	70	211	3 (1.2,7.4), 0.018	0.7(0.33,1.52), 0.37
Training on health and safety?	No	39	73	1	<b>1</b>
	Yes	56	192	2 (1.1, 3.2), 0.015	<b>1.8 (1.13, 3.2), 0.031</b>

## Discussion

This study aimed to determine occupational health and safety status and its associated factors among health professionals during this COVID 19 pandemic at SPHMMC and Ras Desta Memorial Hospitals, Addis Ababa, Ethiopia. In this study, we found that among the total 360 participants 265 (73.6%) of them had good OHS status and 95 (26.4%) of them had poor OHS status. Regarding association factors; work experiences, availability of PPE, availability of disinfectants, availability of water and hand washing facilities, and availability of training on health and safety had a significant association with the OHS status of healthcare professionals at  $P < 0.05$ .

Scientific assessments on health and safety of HCP are necessary in this continued COVID-19 pandemic to take suitable measures and maintain their health and safety and save their life from this fatal pandemic. Therefore, this study showed that more than half of study participants 73.6% (95% CI: 68.9–78.3) of health professionals had good occupational health and safety, while 26.4% (95% CI: 21.7–31.1) health professionals had poor occupational safety and health status. This finding revealed that there were improvements in the OHS status of health professionals when compared to the other study conducted in Oromia, Turkey, and Pakistan at the early stage of the COVID 19 pandemic[4, 12, 13]. This difference might be due to variations in the study setting, socio-cultural difference, availability of PPE and sanitizer at early stage of COVID 19 pandemics and current status to prevent COVID-19 infections of health professionals.

Regarding the availability of PPE (face coverings), HCFs should provide HCPs with appropriate medical face coverings to wear during patient care when performing aerosol-generating procedures according to the WHO and CDC IPC[15, 16]. This study revealed that the availability of face masks increases the OHS status of HCP by 3 times (AOR = 3, 95%CI: 1.7–5.2). This indicated that the shortage of facemask in the hospitals decreases the OHS of HCP during this continued COVID 19 pandemic. This study was similar to a study conducted in Italy and the UK which stated that most health professionals had availability of proper medical facemasks and those who had availability of proper medical masks had low risks of COVID 19 and another infection and their health and safety status was good [5, 26]. This study also showed improvement when compared with other studies conducted during the early stage of the COVID 19 Pandemic when there was a shortage of PPE[11]. The difference might be due to the availability of PPE increased especially facemasks, awareness, and training on the potential use of face masks and IPC use in this continued pandemic.

Occupational health risks from patients to HCPs usually follow contamination of the HCPs' hands after touching either patients or fomites, therefore, availability of waters and hand washing facilities for hand hygiene is considered as the most important prevention measure for healthcare-associated infections including COVID 19 [21–23]. This study finding highlighted the importance of water availability and hand washing facilities in the studied hospitals. Availability of water and hand washing facilities in the working section increases the OHS status of HCP by 2 times (AOR = 2, 95% CI: 1.1–3.4) which is highly consistent with other research[14, 26]. WHO and CDC COVID 19 Infection Control guidelines recommended that healthcare facilities should provide HCPs with access to a safe, continuous water supply at all outlets and access to the necessary facilities to perform hand washing [16, 25].

Availability of disinfection and cleaning agents are essential for ensuring that medical, surgical instruments and working environments do not transmit infectious diseases to patients and healthcare professionals[27]. This study was also revealed that the availability of cleaning and disinfection agents had a significant association with occupational health and safety status of health professionals, HCP those who had availability of cleaning and disinfection agents were 2 times more likely to have good OHS status than their counterparts (AOR = 2, 95% CI: 1.1, 3.7). This finding indicated that lack of cleaning and disinfection agents in the working sections decreases occupational health and safety status of health professionals by 2 times.

According to WHO, Occupational Safety and Health Convention (No. 155) and Recommendation (No. 164): rights, roles, and responsibilities, health professionals and their representatives have the right to receive adequate information and training on occupational health and safety to prevent health and safety hazards in health care facilities[28]. In this study training on health and safety had also an association with the occupational health and safety status of HCP. Training on health and safety for health workers increases the occupational health and safety status of HP by almost 2 times (AOR = 1.8, 95%CI: 1.13–3.2). This study was also similar to a study conducted in Colombia which stated that health and safety about patient care was essential to reduce HP exposure during this continued Pandemic[29].

## **Strength And Limitation Of The Study**

The strength of this study was that applying a mixed approach to both self-administered and interviewer-administered questionnaires to reduce data bias during data collection.

# Limitation

The main limitation of this study was limited literature regarding the health and safety of health professionals during this COVID 19 pandemic

# Conclusion

Health professionals are at the frontline in response to the COVID-19 outbreak, which makes them vulnerable to a higher risk of infection. Therefore, this study found that health professionals' safety was good, but, availability of PPE, availability of water and hand washing facilities, availability of cleaning and disinfectants, and provision of health and safety training for HCP still need to be improved because lack of these predictors decrease occupational health and safety status of health professionals and increase the risk of infections. Thus, the findings of this study may be helpful to hospital leaders to adopt proper occupational health and safety measures for health professionals to reduce infection of the COVID 19 pandemic.

# Abbreviations

**CDC:**Center for Diseases Control and Prevention; **CI:** Confidence Interval; **COVID 19:**Corona Virus Disease 2019; **EFMoH:** EthiopianFederal Ministry of Health; **HCF:**Health Care Facility; **HCP:** Healthcare Professional; **ILO:** International Labor Organization; **IPC:** Infection Prevention and Control;

**OHS:** Occupational Health and Safety; **OR:** Odds Ratio; **PPE:** Personal Protective Equipment; **SPHMMC:** Saint Paul's Hospital Millennium Medical College; **SPSS:** Statistical Package for Social Science; **WHO:** World Health Organization

# Declarations

## Ethics approval and consent to participate

Ethical clearance was obtained from theInstitutional Review Board of Saint Paul's Hospital Millennium Medical College,(permit number: PM23/478). Letters of support were received from this College. The objective of the study was oriented to the hospital leaders and the study subjects. The study was conducted according to the Declaration of Helsinki. Before collecting the data, written informed consent was obtained from each participant. All datacollected from the respondents was secured in confidential

## Consent for publication

Not applicable

## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Competing interests

There is no competing financial interests exist and that no conflict of interest exists

## Funding

There was no fund for this project

## Author Contributions

BG developed the original idea and he was principal investigator of the project. He developed the protocol, collected, analyzed, reported data and prepared manuscript for publication. BA had played great roles (Methodology design, objectives and formulation of research question) from starting to final report writing regarding to this project.

## Acknowledgements

Frist and foremost, we wish to express our deepest gratitude to the almighty of God for his all-time blessing of grace and protection through our daily activities. Next, we would like to express our heartfelt gratefulness to SPHMMC's School of Public Health for granting this project. We would also thank individuals who supported us in this research development.

## References

1. WHO. WHO Director-General's remarks at the media briefing on 2019-nCoV.[Cited 2021.11.15]; Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-remarks-at-the-media-briefing-on-2019-ncov-on-11-february-2020>.
2. WHO. Rational use of personal protective equipment for coronavirus disease 2019 ( COVID-19 ). WHO.2020; (2019):1–7. Available from [https://www.who.int/publications/i/item/rational-use-of-personal-protective-equipment-for-coronavirus-disease-\(covid-19\)-and-considerations-during-severe-shortages](https://www.who.int/publications/i/item/rational-use-of-personal-protective-equipment-for-coronavirus-disease-(covid-19)-and-considerations-during-severe-shortages)
3. Id AY, Grant JM, Loc khart K, Id SB, Sprague S, Id AIO, et al. Infection control , occupational and public health measures including mRNA-based vaccination against SARS-CoV-2 infections to protect healthcare workers from variants of concern. *Pone*. 2021;1–14.
4. Hailu D, Benayew M, Liknaw T, et al. Occupational Health Safety of Health Professionals and Associated Factors During COVID-19 Pandemics at North Showa Zone , Oromia Regional State , Ethiopia. *Dove MPress*.2021;14 1299–1310.
5. Barranco R, Ventura F. Covid-19 and infection in health-care workers: An emerging problem The silent deaths of the elderly in long-term care facilities during the Covid-19 pandemic: *Medico-Legal Journal*.2020; 88(2): 65–66. <https://doi.org/10.1177/0025817220923694>.
6. Nyame-Annan EKP. Occupational Hazards And Safety Practices Among Hospital Workers At Greater Accra Regional Hospital, Ridge. 2017;(10323750):48-69.
7. Chersich MF, Gray G, Fairlie L, Eichbaum Q, Mayhew S, Allwood B, et al. COVID-19 in Africa : care and protection for frontline healthcare workers. *HealGlob*.2020;16(46):1–6. <https://doi.org/10.1186/s12992-020-00574-3>
8. Alhumaid S, Mutair A Al, Alawi Z Al, Alsuliman M, Ahmed GY, Rabaan AA, et al. Knowledge of infection prevention and control among healthcare workers and factors influencing compliance: a systematic review. *Antimicrob Resist Infect Control*. 2021;1–32.

9. Jeon YW, Park ES, Jung SJ, Kim Y, Choi JY, Kim HC. Protection of Healthcare Workers Against COVID-19 at a Large Teaching Hospital in Seoul, Korea. *The Medico-legal Journal*. 2020;61(7):88(2):65-66. [https:// DOI: 10.1177/0025817220923694](https://doi.org/10.1177/0025817220923694).
10. WHO. Occupational health and safety for health workers. COVID-19 Occup Heal Saf Heal Work [cited 2021.11.15]. Available from: <https://www.who.int/news/item/09-03-2020-covid-19-occupational-health>
11. Id AM, Shibiru S, Girma M, Ayele G, Id AB. Health professionals practice and associated factors towards precautionary measures for COVID-19 pandemic in public health facilities of Gamo zone, southern Ethiopia. *Plosone*. 2021;(6):1–17.
12. Ozturk H, Babacan E. The Occupational Safety of Health Professionals Working at Community and Family Health Centers. *Iran Red Crescent Med J*. 2014;16(10):319.
13. Muhmmad S, Muhammad M, Saif, Aqsa G. Knowledge, attitude, practice and perceived barriers among healthcare professionals regarding COVID-19: A Cross-sectional survey from Pakistan. *Angew Chemie Int Ed* 6(11), 951–952.
14. Mossburg S, Agore A, Nkimbeng M, Commodore-Mensah Y. Occupational hazards among healthcare workers in africa: A systematic review. *Ann Glob Heal*. 2019;85(1):1–13.
15. Initiative AJ. *Guide to Prevention and Control of Infectious Diseases in the Workplace*. BC Public Service Agency. 2007;
16. Ran L, Chen X, Wang Y, Wu W, Zhang L, Tan X. Risk Factors of Healthcare Workers with Coronavirus Disease 2019: A Retrospective Cohort Study in a Designated Hospital of Wuhan in China. *Clin Infect Dis*. 2020;71(16):2218–21.
17. Singh D, Joshi K, Samuel A, Patra J, Mahindroo N. Alcohol-based hand sanitizers as first line of defense against SARS CoV-2: A review of biology, chemistry and formulations. *Epidemiol Infect*. 2020;
18. Golin AP, Bhsc DC, Ghahary A. Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19 . The COVID-19 resource centre is hosted on Elsevier Connect , the company ' s public news and information. *Am J Infect Control*. 2020;48(1)
19. Ward D. Infection prevention and control in primary care. *Nursing in Practice*. [cited 2021.11.15]. Available from: <https://www.nursinginpractice.com/article/infection-prevention-and-control-primary-care>
20. CDC. COVID-19 Interim Infection Prevention and Control Recommendations for Healthcare Personnel During the Coronavirus Disease 2019 ( COVID-19 ) Pandemic Additional Key Resources: 2021; [cited 2021.11.15]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/infection-control-recommendations.html>.....
21. Rubbi I, Pasquinelli G, Brighenti A, Fanelli M, Nanni E, Antoni VD, et al. Healthcare personnel exposure to COVID - 19: an observational study on quarantined positive workers. *Acta Biomed for Health Professions*. 2020;(91):12-14.
22. Personal protective equipment ( PPE ) and infection among healthcare workers – What is the evidence? *IDiseases*. 2020;(5):4–6.
23. Dagne H, Atnafu A, Alemu K, Azale T, Yitayih S, Dagne B, et al. Anxiety and associated factors among Ethiopian health professionals at early stage of COVID-19 pandemic in Ethiopia. *Pone* . 2021;16(6 ):1–11.
24. 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*. 2020;48(1).
25. WHO. Occupational safety and health in public health emergencies. World Health Organization. 2018. [cited 2021.11.15]. Available from: <https://apps.who.int/iris/bitstream/handle/10665/275385/9789241514347->

26. Protano C, Cammalleri V, Spica VR, Valeriani F, Vitali M. Hospital environment as a reservoir for cross transmission : cleaning and disinfection procedures. *American J. Control.* 2019;(31)436–48.
27. Rutala WA, Weber DJ. *Disinfection and sterilization in healthcare facilities. Bennett Brachman's Hosp Infect Sixth Ed.* 2013.
28. World Health Organization. *Coronavirus Disease ( Covid-19 ) Outbreak : Rights , Roles and Responsibilities of Health Workers , Including Key Considerations for Occupational Safety.* World Heal Organ. 2019;1–3.
29. Betancourt-sánchez LC, Ochoa-gelvez EO, Velásquez-bernal CC, Rozo-silva YA, Quiroga-vargas DA. *Occupational health in the framework of the COVID-19 pandemic: a scoping review.* 2020;22(3):1–8.