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ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCES

SCHOOL OF MEDICINE

DEPARTMENT OF INTERNAL MEDICINE

Research title;

Knowledge, attitude and practice of health care workers towards personal protective equipment in the era of Covid-19

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A thesis submitted to Addis Ababa University, college of health sciences, department of internal medicine, in partial fulfillment of the requirement for specialty certificate in Internal Medicine

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Addis Ababa University

College of health sciences

School of medicine

Department of Internal Medicine

Knowledge, attitude and practice of health care workers on personal protective equipment use, a cross sectional study

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Acknowledgment

I would like to thank my advisors for their immense contribution throughout the journey of this manuscript.

Acronyms and Abbreviations

COVID-19: Corona virus infection disease, 2109

EKGH: Eka Kotebe General hospital

HCWs: Health care workers

IPC: Infection prevention and control

MERS CoV: Meditranian Eastern Respiratiory Syndrom

MOH: Minster of health

PPE: Personal protective equipment

SARS: Severe acute respiratory syndrome

TASH: Tikur Anbesa Specialized Hospital

WHO: World health organization

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Abstract

***Background**; in this era of COVID-19 epidemic health care workers are at increased risk of contracting the disease. The WHO estimates that around 20% of HCW have already acquired the infection in the world worst affected areas. It is a paramount important to prevent spread of infection among the HCWs as they can be a source of community transmission. There are some evidences showing there is a gap in knowledge, attitude and practice of personal protective equipment use among the health care workers.*

***Objective:** To assess knowledge, attitude and practice of PPE among HCWs that are currently working in Tikur Anbessa Specialized hospital and Eka Kotebe general hospital, Addis Ababa, Ethiopia.*

***Methodology:** This cross-sectional, descriptive study was conducted on HCWs of TASH and EKGH in the month of October 2020. Participants were selected using convenient sampling method and 45 itemed, web-based, self-administered questionnaires were used for data collection via internet access. Data analysis was done using SPSS version 26. Socio-demographic and important information assessing KAP were collected.*

***Result**: A total of 277 HCWs responded to the questionnaire from both centers. The mean age was 30.77±5.78 years. Among them majority was male (n=158, 57%) and majority were from TASH 261 (94.2%). Medical doctors constituted 73.2% (n=203) followed by nurses (n=70, 25.3%). On average, 38.6% had 8hours of work per day. Among the responders, 18.8% (n=51) uses informal ways to gather information and 19.1% (n=53) of HCWs tested positive for COVID-19. Knowledge, attitude and practices regarding PPE use among these HCWs were 73.9%, 40.3% and 57.7% respectively.*

***Conclusion and Recommendation:** This survey shows that there is poor attitude and practice of PPE especially N95 use among HCWs. Institution based training and inclusive updates needs to be implemented.*

Introduction

1.1. Background of the study

Healthcare workers are vulnerable for contracting corona virus disease 19. Worldwide, although data vary, WHO estimates 20% of HCW are infected with the virus in the worst affected regions including USA and Italy. Moreover, in china retrospective data showed HCW infection rate was 2-3%. (1) To date, according to the Ethiopian ministry of health, more than 1000health care professionals, including doctors, nurses and other staff, are confirmed of being infected by the corona virus. COVID-19 is predominantly caused by contact or droplet transmission attributed to relatively large respiratory particles which are subject to gravitational forces and travel only approximately one meter from the patient. Airborne transmission may occur if patient respiratory activity or medical procedures generate respiratory aerosols.

The levels of protection are incremental: droplet precautions are also designed to prevent contact transmission; airborne precautions also to prevent droplet and contact transmission. Health care workers (HCWs) are at a high risk of getting the infection and the source of transmission in the community. Some previous studies showed that HCWs had a lack of knowledge and attitude toward MERS CoV and SARS. It is essential that staff understand the purpose of PPE and its role as part of a system to reduce disease transmission from patients to staff and other patients. It is equally important that staff use it appropriately to preserve what may be limited stocks to ensure there is sufficient supply for necessary use throughout the epidemic surge.

1.2. Statement of the Problem

Corona virus disease 2019 is a new strain of corona virus groups of disease. All health institutions and professionals have limited experience. MOH report showed a number health professionals working in non COVID centers with confirmed with positive results for COVID-19. Currently, there is scarce information regarding knowledge, perception and practice of HCWs about appropriate utilization of PPE. Even though resources and Medias has been mobilized to fight against the disease, HCWs needs continues update of their knowledge and attitude as well as preventive practices.

1.3. Significance of the study

Good knowledge, attitudes and practices towards COVID-19 amongst healthcare workers in resource limited settings are a central pillar of infection prevention and control (IPC). HCWs level of knowledge and practice needs to be assessed continuously for effective preventive strategies of the disease. Unlike other countries, data is not available in Ethiopia which could asses HCWs knowledge, attitude and practice towards COVID- 19. If we can determine factors affecting attitude and practice of HCWs towards the virus at the current stage, strategies will be re-designed focusing on identified gaps. This research was a baseline reference for further policy making and law enforcing

Literature Review

Corona viruses are a group of RNA virus causing varieties of respiratory illnesses throughout the history of human being. A new strain called novel corona virus which causes cluster of respiratory infection cases has been discovered in Wuhan city, Hubei province of China, in December 201 9. (1) The empirical clinical data of the first few cases in china have shown that the case fatality rate of COVID-19 being 2-3%. Even if the case fatality is significantly low, one person can infect on average 2 to 3 people. (2)

The highest viral load of SARS-CoV-2, the virus causing COVID-19, is in sputum and upper air way secretions. While viremia can occur, blood-borne infection is not considered a major source of transmission. (3) The virus is predominantly spread by droplet and contact routes. Droplet transmission is via larger respiratory particles, generally above 5 micrometer diameter, which are subject to gravitational forces. These tend to travel no more than one meter. A two-meter limit on contact is therefore precautionary. Contact transmission occurs because once the virus is on a surface; it will remain there and will be a potential source of infection for a period of hours or even days. This creates the risk that healthcare workers touching that surface will become contaminated and subsequently they, or others, will become infected. (4)

Due to the increasing number of suspected cases worldwide and the virus unpredictable future countries are facing a great challenge in tackling the pandemic. Currently, there is no specific antiviral treatment or preventive vaccine. Therefore, institution of preventive and screening strategy is paramount to decrease the spread of infection. The best prevention is to avoid being exposed to C OVID-19. This is done by washing hands with soap and water and using face mask, isolating confirmed and suspected cases.(2)

In the community infected person can spread the disease with nosocomial transmission being the major focus of exposure of health care workers and other non-COVID-19 patients. (2)

WHO recommends for the rational use of personal protective equipment (PPE) in healthcare and community settings. Healthcare workers involved in the direct care of patients should use the following PPE: gowns, gloves, medical mask and eye protection (goggles or face shield). Specifically, for aerosol-generating procedures (e.g., tracheal intubation, non-invasive ventilation, tracheostomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy) health care workers should use respirators, eye protection, gloves and gowns; aprons should also be use d if gowns are not fluid resistant .(2) Respirators (e. g., N95, FFP2 or equivalent standard) have been used for an extended time during previous public health emergencies involving acute respiratory illness when PPE was in short supply. This refers to wearing the same respirator while caring for multiple patients who have the same diagnosis without removing it, and evidence indicates that respirators maintain their protection when used for extended periods. However, using one respirator for longer than 4 hours can lead to discomfort and should be avoided. (5-7)

Personal protective equipment should be simple to remove after use without contaminating the user. Experience from the SARS epidemic in Canada, which was associated with high rates of healthcare worker infection, indicates that complex PPE is likely to increase risk of contamination during removal. It should be disposable whenever possible and disposed of appropriately, immediately after removal. (8)

Adherence to infection control policy is driven in part by the individual HCW belief in the recommended effectiveness of the infection control measures.(9) Specifically, self-protective infection control behaviors are cognitively driven by experience, knowledge, subjective norms, and risk appraisal by the individual, whereas noncompliance is driven by a perception that infection control measures hinder task performance.(9,10) Individual factors however require further consideration. Knowing which infection control measures are used by HCWs when confronted with patients with respiratory viral infections and what drives this choice is critical knowledge because it highlights potential targets for infection control improvement interventions. (11)

Past experience shows that HCWs are at increased risk of infection in influenza pandemics. (12) A basic tool to reduce their infection rates, thus lessening the spread of pandemic, is the proper use of PPE, which includes gloves, dressing gowns, masks, and protective eyewear. Appropriate use of PPE by HCWs has been shown to reduce transmission of influenza in health care settings, resulting in decreased influenza-related patient morbidity and mortality, as well as reduced HCW illness and absenteeism. (13) In spite of the PPEs proven efficacy, its misuse and low HCW compliance are frequently reported. (12-15)

Confidence in PPE was in turn found to be related to HCW training regarding PPE and its use. Conversely one can assume that low levels of knowledge among HCW about the diffusion mechanisms of infectious diseases and the protection offered by PPE will decrease confidence in these measures and increase fear and risk perception. In previous pandemics, such feelings were associated with decreased HCW willingness to treat patients and increased absenteeism (16). The same studies also found that as many as 50% of HCW surveyed stated that they would be unwilling to work in case of an influenza pandemic. A study that examined the impact of the H1N1 influenza pandemic on Canadian HCWs reported significant rates of influenza-like illness and absenteeism.

Ugandan study revealed that majority of HCWs at Makerere University Teaching Hospitals has a negative attitude toward COVID-19 which is in congruence with a KAPs study on Ebola in Ethiopia among HCWs but in contrast to Giaos study on COVID-19. (17-19) only 44% of the HCWs in Ugandans study agreed that they could confidently participate in the management of patients with COVID-19 which implies that adequate information on COVID-19 case management should be provided to the HCWs.

(2)

Numerous studies have shown that HCWs generally comply poorly with respirator regulations. Reasons for HCWs not using respirator include not having respirator readily available or not knowing that a patient has transmittable disease. Other factors that appear to influence respirator practices are individuals' perception and knowledge. (20,21) Some previous studies showed that HCWs had a lack of knowledge and attitude towards MERS CoV and SARS. (23,24)

Knowledge can be improved through measures such as training, while attitude could shape and influence behavior. The right knowledge along with the right attitude can eventually lead to promotion of practice and healthy behavior.

OBJECTIVES OF THE STUDY

3.1. General Objectives

- The general objective of this study was to assess the knowledge level, attitude and evaluate practice towards proper use of personal protective equipment to combat corona virus disease 2019 among health care workers of TASH and EKGH in the month of October, 2020.

3.2. Specific Objectives

1. To assess the knowledge level of HCWs of TASH and EKGH regarding recommended utilization PPEs during covid-19 pandemic.

2. To assess the attitude of these HCWs toward the general use of PPE for COVID-19 prevention.

3. To evaluate the practice of these HCWs in adherence to appropriate PPE use

4. To determine factors affecting the knowledge and practice of proper PPE uses

5. To compare the practice of PPE use among different level of HCWs currently working in TASH and EKGH.

Methodology

4.1 Study setting

4.1.1. Study area

This study was conducted at Tikur Anbessa Specialized hospital, one of the pioneer referral hospital which is also currently one of among non-Covid-19 designated hospitals and Eka Kotebe general hospital, recently established general hospital which is currently Covid-19 treating center, both located in capital city of Ethiopia, Addis Ababa.

TASH is referral center for many referral hospitals as well and a hospital under which vast clinical service is given, including some specialty services only found in TASH. It is one of the biggest and pioneer teaching centers under the administration of Addis Ababa University. The college runs multiple postgraduate and fellowship programs, not to mention it has been the earliest center for undergraduate medicine program for more than 50 years.

In TASH, based on current data, a total of 325 consultant physicians, 889 Resident physicians, 220 intern physicians, 401 clinical Nurses, 73 Laboratory technicians and 60 pharmacy professional which makes a total of 1968 HCWs are dedicated in giving health care services.

After the pandemic with COVID-19 worldwide, although, TASH has been reserved for later response it established an isolation center at which patients with suspected/confirmed cases can be isolated and treated. It is a two-floored center dedicated to treat suspected/confirmed cases of COVID-19 with moderate and severe diseases. Patients from ER, OR, Non-Covid ICU or general wards will be transferred to the center after samples were taken if they have been suspected to contract the infection. There are rotating internal medicine residents in consultation with senior sub-specialties together with nurses, pharmacy professions, runners and cleaners assigned to these floors for the care and treatment of these patients.

This study was also conducted in Eka Kotebe general hospital (EKGH), the first Covid-19 treating hospital in Addis Ababa. It was initially established as part of Amanuel hospital and later in April 2020 it was decided to make it stand alone federal hospital. Currently, it has now a capacity of 600 beds among them 16 beds dedicate to intensive care unit. The hospital has 130 Nurses, 90 general practitioners, 14 different specialty and sub-specialty trained physicians making a total of 234 HCWs. Seven of these physicians are AAU, TASH staffs.

4.1.2. Study design and time

A cross sectional study survey on knowledge, attitude and practice of HCW at TASH and EKGH was conducted in the month of October, 2020 for a duration of three weeks from Oct 7 – Oct 31.

4.2 Source and study population

Health care workers who are involved in the care of patients either in COVID treating or non-treating hospitals were the source population. Specific HCWs who are currently working/on hospital job in TASH and EKGH were the study population. These include wide range, as ranked based on level of professions, of doctors (From level of Sub-specialist doctors to Intern Doctors), different level of nurses, laboratory professionals and pharmacy professionals who were involved in the current medical care of both Covid and non-covid patients.

4.3 Sampling technique

To determine the number of participants that should be included in the current study, sample size was calculated based on estimation number of health care workers currently involved in clinical practice of both TASH and EKGH. There were around combined 2202 HCWs on job at TASH and at EKGH.

Using p value as 50% for previously unknown value; sample size was calculated using Hollander's formula with confidence level of 95% and margin of error 5%. Where;

N= Total HCW in TASH and EKH is estimated as 2202.

d= margin of error

P= proportion

α=degree of accuracy

n = sample size

$$n = \frac{\frac{Z^2 p(1-p)}{d^2}}{1+\frac{1}{N}\left(\frac{Z^2 p(1-p)}{d^2}\right)} = 384.$$

Number of HCWs in EKGH was approximately 10% of numbers found in TASH, among the calculated sample size 40 participants were needed from the study area 2(EKGH). However, due to time constraint with which the study needed to be competed, convenient sampling was used instead of the calculated sample size. The study included all HCWs who responded to the online survey form sent via internet.

HCWs in these two hospitals who are currently working at TASH and EKGH were the sampling frame. Because of the limited access to exact proportion numbers of HCWs, especially TASH, within this short period the study intended to be completed, proportion of these professions were not determined. Self-administered questionnaire was prepared and sent to almost all clinical working units and departments of TASH through means of social media platforms and all responders were included. To address the study population, for those who didn't use these means of communication print out forms of questionnaires were prepared.

4.4. Inclusion and exclusion criteria

4.4.1. Inclusion criteria

- HCWs working in different clinical sections of TASH and EKGH
- HCWs who gave their consent to respond.

4.4.2. Exclusion criteria

- HCWs who were too ill to participate
- HCWs who were not working actively (in the past 1 month)

4.5 Study Variables

4.4.1 Dependent variables

- Knowledge, attitude and practice on the use of PPE for prevention of COVID-19

4.4.2 Independent variable

- Age
- Sex
- Profession
- Place of department
- Level of exposure to COVID-19
- Work experience in years
- Work load in hours
- Sources of information
- Previous infection with COVID-19
- Experience/exposure to COVID treating/isolating centers

4.7 Operational definitions

1. Health care workers: All paid and unpaid persons serving in healthcare settings, with primary intent to enhance health, who have the potential for direct or indirect exposure to patients or their infectious secretions and materials.(3)
2. Personal protective equipment: are garments placed to protect the health care workers or any other persons to get infected. These usually consist of standard precautions: gloves, mask, and gown. If it is blood or airborne high infections, will include: Face protection, goggles and mask or face shield, gloves, gown or coverall, head cover, rubber boots.
3. Corona virus disease 19: Acute disease of the respiratory system which is caused by new CORONA virus groups identified in humans since the end of December 2019 in Chinese Wuhan. (4)
4. COVID-19 designated/treating centers/hospitals: Hospitals which have HCWs and health care services dedicated to treat confirmed COVID-19 patients.
5. Non COVID-19 treating centers/hospitals: Hospitals which might treat patients suspected to have COVID-19 temporarily through isolation centers inside the hospitals dedicated to COVID-19.
6. Confirmed COVID-19 infection: A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.(4)
7. Aerosol generating procedures: procedures involving Non-invasive and invasive ventilation, intubation, bronchoscopy, tracheostomy, CPR. (4)

4.8 Data collection and procedures

4.8.1 Data collection instrument

The current study was conducted on health care workers of TASH and EKGH using structures self-administered questionnaires. To facilitate data collection online form was created using Google forms and disseminated by means of email or social media accesses according to the convenience of participants. These online forms contained questions regarding basic socio-demographic information and detailed questions on the knowledge, attitude and practice regarding PPE use among the study population. Automatically generated data on Microsoft excel then was transferred to the SPSS version 26 for analysis.

4.8.2 Data quality management

Each component of the form was tied as required to minimize the risk of having a missed data. After submission, completeness was checked instantly. The data was high quality because first-hand information was gathered directly through a self-administered questionnaire which were basically anonymous. The online format used a single address for a single responder to avoid data duplication. For the convenient of responders, email address was not included as requirement.

The filled document was automatically transported to Microsoft excel. Thus, this decreased risk of error from manually typing findings. Pilot study was done for 5% of initial responders to check the appropriateness of questions so that accurate data can be generated.

4.8.3. Data analysis and presentation

After collecting, data cleaning and checking for its appropriate level of quality, the data generated was transported to IBM SPSS Version 26 and was analyzed. Statistical analysis was done electronically and descriptive analysis was presented in the form of frequencies and percentages through simple graphic representations.

Analytical data was generated and presented using different types of correlation and regression models as needed. For all variables a p value of <0.05.

4.9. Ethical clearance

As a means of approval of this study, ethical clearance was obtained from department of internal medicine, AAU CHS research committee for post graduate program and IRB of EKGH. Consent was obtained from HCW to participate in the study and one could have the right to withdraw at any point during the data collection. The information gathered was kept completely anonymous since this was mostly internet based online survey and participant was not be required to fill for their names or personal addresses.

4.10 Dissemination of the result

The results of this study will be submitted to department of internal medicine in written document as part of partial fulfillment for graduation. Moreover, the result will be submitted to EKGH management. It is going to be essential asset for both hospitals and other policy makers in bringing practice change in the management of patients with COVID-19. Moreover, it will be published in reputable research site.

Results

5.1 Socio-demographic characteristics of study participants

Two hundred and seventy seven (277) health care workers (HCW) of both TASH and EKGH participated in this study. Table 1 shows socio-demographic characteristics of the participants. The mean age was 30.77±5.78 years (range: 24-60 years) with majority being in the age range of 20-29 years. (n= 165, 58.5%).

Among the responders males had slightly high proportion (n=158, 57%) and majority were working at TASH or at its affiliated sites 261 (94.2%) with work experience of 5 years or less (n=172, 62.1%). 5 years was a median work experience for our participants as a heath care givers with experiences ranging from less than 1 year to 36 years. For resident doctors mean of year of residency was 2.5±1year.

Combined specialized, on-training and general practitioner doctors constituted 73.2% (n=203) of HCWs. Half of the participants were resident doctors of different specialty training programs (n=143, 51.6%) followed by nurses (n=70, 25.3%) and 14% (n=39) were specialists and sub-specialist doctors. (See figure 3) At both hospitals, 44% (n=103) of the HCWs are practicing in the internal medicine department. For HCWs working in both institutions average daily work duration is 8hours. (8.25±3.182 hours) In regards to additional hours of work 69% (n=191) didn't report to have private practice and average daily working hour is 8hours or less for 64.6 % (n=179).

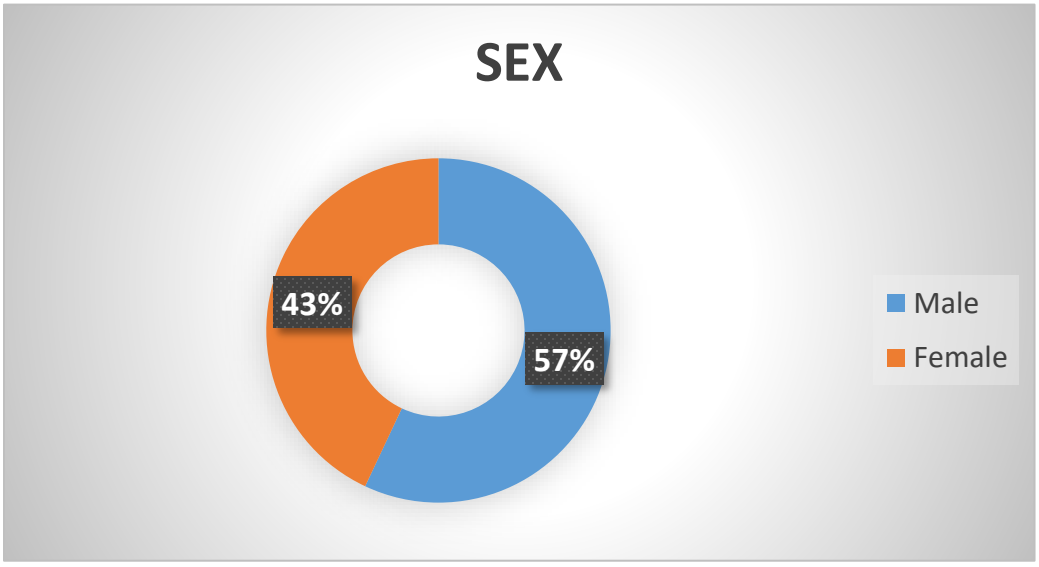

Figure 1. Shows sex distribution

Table 1. Socio-demographic characteristics of HCWs

Variables	Frequency	Percentage
Age (years)		
20-29	162	58.5
30-39	90	32.5
40-49	18	6.5
50-59	6	2.2
>=60	1	0.4
Sex		
Male	158	57.0
Female	119	43.0
Work place		
TASH	261	94.2
EKGH	16	5.8
Profession		

Sub-specialist	22	7.9
Specialist	17	6.1
Resident	143	51.6
General practitioner	7	2.5
Intern	14	5.1
Nurse	70	25.3
Lab professional	2	.7
Pharmacy	2	.7
Department		
Internal medicine	103	44.0
Surgery	49	20.9
Neurology	9	3.8
Pediatrics	18	7.7
ER	18	7.7
Radiology	12	5.1
OB/GYN	8	3.4
Anesthesia	5	2.1
Oncology	4	1.7
Psychiatry	3	1.3
Others	5	2.2
Work experience in years		
0-5	172	62.1
6-10	70	25.3
11-15	19	6.9
16-20	8	2.9
>=20	8	2.9

Average work hour		
0-8	179	64.6
>8	98	35.4
Additional private practice		
Yes	86	31.0
No	191	69.0

5.2 Experience with COVID-19 in HCWs

98 (35.6%) of this survey respondents reported to have experience in working at COVID-19 dedicated centers during the study time. This was also true for participants from TASH where exposure to COVID-19 isolation units were 37.4% (n=98). (See table 2) Nurses (26 out of 64) and Residents (58 out of 143) were more likely go to COVID isolation areas than specialist (5 out of 14) and sub-specialists (5 out of 22).

Although 52.2% (n=150) had some form of infection prevention and control (IPC) training in their career age, only 43% (n=119) had self-initiated or institution based COVID-19 specific IPC training exposures at both centers. Among these, 107 (89.9%) had a formal means of training whereas 10.1% (n=12) has social media based training. Additionally, 18.8% (n=51) of HCW solely used either social medias, NEWS or informal discussions among their friends as a source of information regarding COVID-19 pandemic. (see Figure 2)

19.1% (n=53) of HCWs from both institutions (EKGH; n=4) tested positive for SARS Cov-19 so far. Additionally, although statistically insignificant, nurses reported slightly higher rate of getting infected. (17 out of 70 and 36 out of 203)

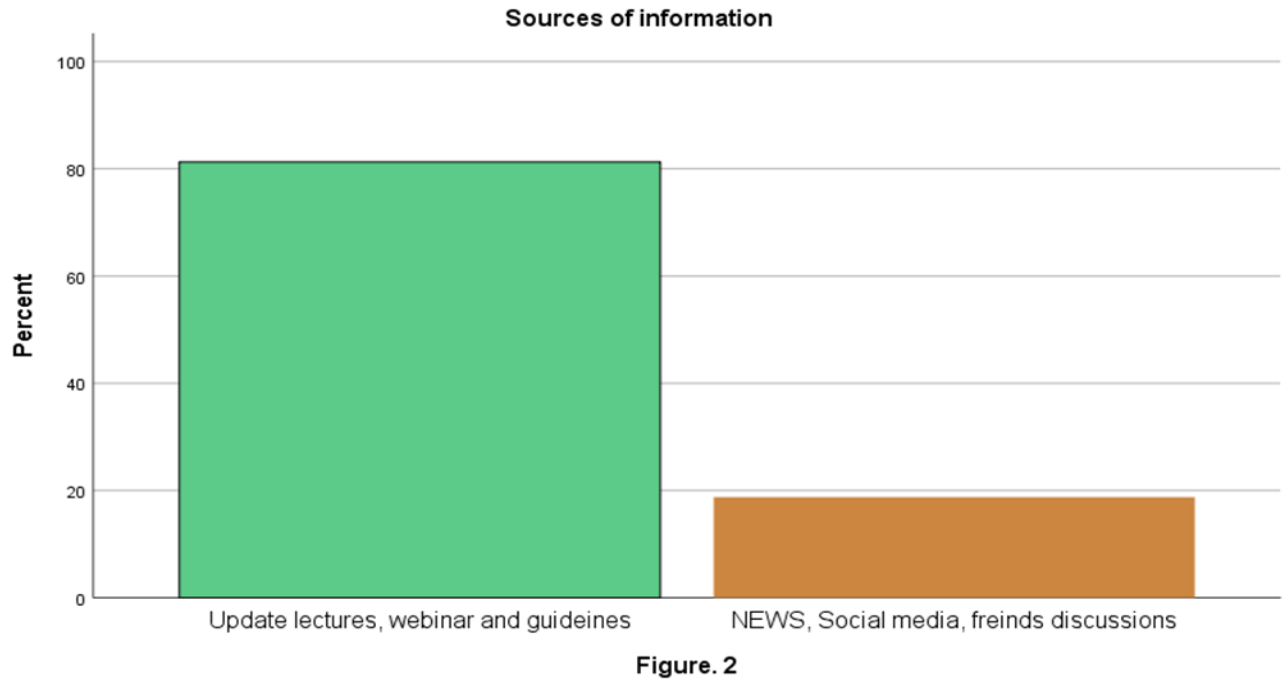

Figure 2. Shows usual source of information for HCWs

5.3 Knowledge of HCW regarding use of PPE

Assessment of knowledge was made using a six (0-6) set of questions regarding mechanisms of COVID-19 transmissions and basic strategies outlined by WHO guidelines as means of infection prevention and control. The respondents of this study had overall good knowledge regarding PPE use against COVID-19 infection which was 73.86% (Range 24.2% - 88.4%). (Table 2)

Two hundred forty five (n=245, 88.4%) responders have correctly identified most important means of protection for contact mechanism. Important strategies that should be implemented to prevent COVID-19 by droplet and aerosol mechanisms was answered by 85.4% (n=234) and 84.1% (n=233) of the HCWs.

82% of responders think that it is appropriate to wear surgical masks while working in close contact with a patient. Among the knowledge parameters correct response was low for the last question implying only 67 (24.2%) of the respondents think it is appropriate for a HCW to wear N95 all the time in the hospital compound.

5.4 Attitude of HCWs regarding use of PPE

Overall proportion of positive attitude is 40.3% among HCW currently working in TASH and EKGH. Two hundred and sixty one (n=261, 94.2%) participants believes that PPE is protective against COVID-19. However, 12 (4.3%) of them are uncertain if adequate protections are provided by the currently available PPE.

Moreover, only thirty four responders (n=34, 12.3%) believe that their institution is providing them with enough PPE supplies the other 81.6% and 6.1% feels like they are not or are not sure if they are being given enough amounts respectively.

Among the different means of personal protective equipment which are currently available at both institutions only 58 (20.9%) of responders think that they are of standard quality. The great majority (65%) believes that available PPEs are not standard and the rest are not sure to give answers. (n=39, 14.1%) It is also interesting to note that among the list of PPEs almost three forth (70%) of HCWs think that qualities of N95 are not standard. Additional, 50%, 48% and 45% of HCWs feels full body cover gown, surgical masks and face-shield/goggles are not standard quality respectively.

Notably, hundred ninety one (n=191, 69%) of the participants feels that their institution doesn't use appropriate guidelines in distributing available PPE. Hence, they think that N95 masks and gloves should have been provided more appropriately by their institution than the other means of PPEs. (See Figure 4)

More than half of HCWs believe rational uses of PPE could be poor among themselves. (n=154, 55.6%) However, majority of the study participants believe training regarding use of PPE would change practice among HCWs. (n=219, 79.1%)

In regards to having enough confidence in managing COVID-19 patients, almost half of the participants (45.5%) are not certain whether they feel confident in managing such patients. Despite a high proportion (81%) of belief that HCWs should only avoid direct contact with a patient if the patient is suspected/confirmed to have COVID-19 in the absence of adequate PPE, 58.8% of responders are aware of a HCW avoiding such activities.

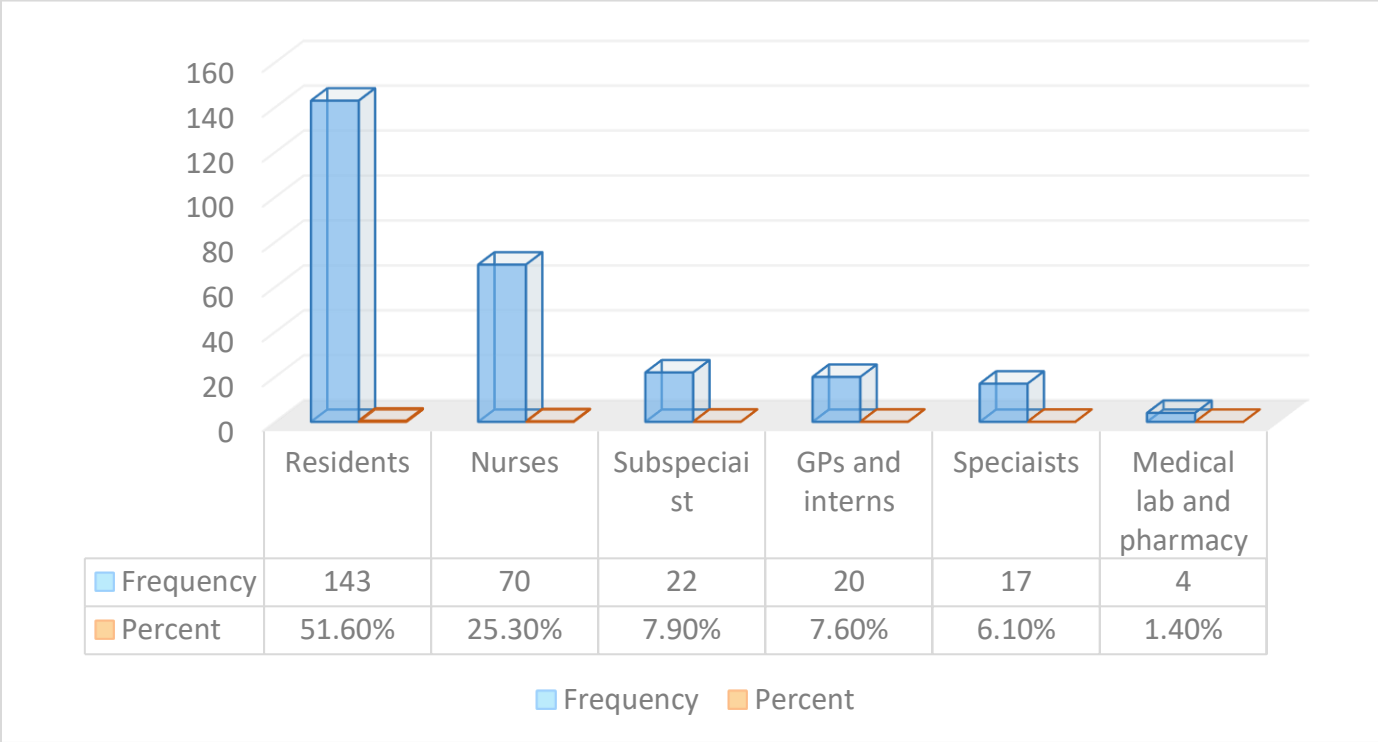

Figure 3. Distribution of HCWs by profession

5.5 Practice of PPE use among HCW

In general, half of HCW practicing in the era of COVID-19 pandemic properly utilizes their PPE. Table 2 demonstrates the six domains used to assess PPE utilization. It is interesting to note that only a quarter of participants reported proper use towards their N95 respirator masks (n=65, 23.5%). Almost 3% of them reported that they have never used N95 respirator masks in their clinical practice. Considering other means of PPE, 53.3% of study participants had use of eye protectors as per standard guideline recommendations. Moreover, a little more than half of the HCW use their surgical masks during patient evaluation, inside hospital compounds and in the community as well (n=154, 55.6%).

Although It was a bit difficult to some up finding gained from assessments of surgical mask use, 55% f HCWs reported to use surgical masks almost all the time (Every time they see a patient, in the hospital compound or in the community).

82% of study population have good practice of disinfecting their N95 masks before reusing it. Almost similar proportion of good practice (82%) was seen in keeping strict rules during taking out PPE (Doffing) because majority agreed on importance of doffing rules. However, 60% reported either uncertainties or being not confident in applying donning and doffing practices. Hence a lesser proportion of HCWs were found to be confident in properly wearing and taking off PPEs. (40%, n=111)

In conclusion, the overall practice proportion from a six domain assessment tool was found to be 57.65%.

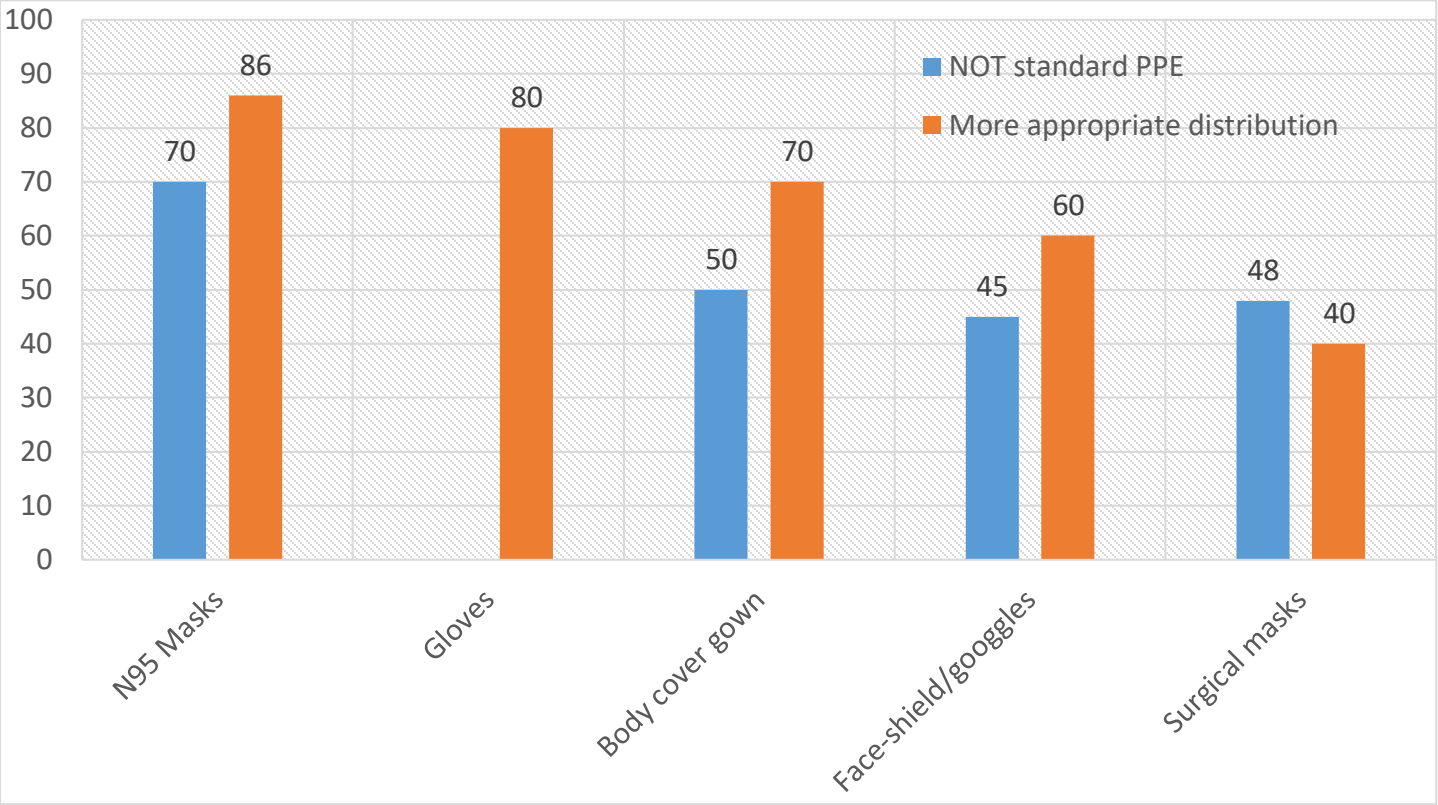

Figure 4. Attitude of HCWs towards which PPE items are Non-standard and are not properly distributed by institution

Table 2. Knowledge, attitude and practice of COVID-19 specific PPE use among HCWs

S/No	2.1. Knowledge domains	Yes	No	
1	The most important precautions used by HCWs to prevent transmission of COVID-19 through droplet mechanism should include eye protection (use of goggles and face shield), wearing surgical masks, and maintaining physical distance and isolate patients in separate area.	234 (85.4%)	40(14.6%)	
2	The most important precautions used by HCWs to prevent transmission of COVID-19 through contact mechanism should include wearing gloves and long sleeved disposable gown and frequent hand washing /alcohol hand rub.	245 (88.4%)	32 (11.6%)	
3	The most important precautions used by HCWs to prevent transmission of COVID-19 through aerosol mechanism should include wearing N95 or equivalent masks during aerosol generating procedures.	233 (84.1%)	44 (15.9%)	
4	It is appropriate to combine all three protection methods during aerosol generating procedures.	215 (78.8%)	58 (21.2%)	
5	It is appropriate for HCWs to wear surgical masks while working in close contact.	228 (82.3%)	49 (17.7%)	
6	It is appropriate for HCWs to wear N95 respirators in the hospital compound.	210 (75.8%)	67 (24.2%)	
2.2. Attitude domain				
1	Believe PPE protects against COVID-19	**Yes**	**No**	**Indifferent**
		261 (94.2%)	9 (3.2%)	7 (2.5%)
2	Believe PPE is highly protective against COVID-19	**Yes**	**Indifferent**	
		249 (89.9%)	12 (4.3%)	
3	Believe available PPE are standard quality	**Yes**	**No**	**Indifferent**
		58	180	39 (14.1%)

		(20.9%)	(65%)	
4	Do you believe your institution provides you with enough PPE	34 (12.3%)	226 (81.6 %)	17 (6.1%)
5	Do you feel your institution using appropriate guidelines on PPE distribution?	40 (14.8%)	191 (69%)	45 (16.3%)
6	Do you think HCWs use PPE rationally?	43 (15.5%)	154 (55.6 %)	80 (29%)
7	Do you think you are confident in giving care for COVD positive patients?	85 (30.7%)	65 (23.6 %)	126 (45.5%)
8	Do you believe training would impact on use of PPE?	219 (79.1%)	22 (7.9%)	36 (13%)
9	Do you know any HCW who avoids any contact with patient in fear of acquiring COVID-19?	163 (58.8%)	92 (33.2 %)	22 (7.9%)
10	Do you believe it is appropriate for a HCW to avoid physical examination and/or patient visit only if patient is suspected/confirmed to have COVID-1, otherwise not?	**Yes**	**No**	
		217 (81.0%)	51 (19.0%)	
2.3. Practice domain				
1	I use N95 as per international (WHO or CDC) guidelines recommendations?	**Yes**	**No**	**NO N95 mask**
		65 (23.5%)	203 (73.3 %)	8 (2.9%)
2	I use face-shied and goggles as per international (WHO or CDC) guidelines recommendations?	**Yes**	**No**	
		147	129	

		(53.3%)	(46.7)	
3	Do you follow standard precautions for disinfecting your N95 mask?	**Yes**	**No**	
		219 (81.7%)	49 (18.3 %)	
4	Do you feel confident in applying PPEs all the time?	**Yes**	**No**	**Not sure**
		111 (40.1%)	107 (38.6 %)	59 (21.3%)
5	I frequently make mistakes while applying PPE (Donning and doffing)	**Yes**	**No**	**No experience**
		48 (17.3%)	182 (65.7 %)	47 (17.0%)
6	Do you think proper doffing is mandatory?	**Yes**	**No**	**Not sure**
		226 (81.6%)	17 (6.1%)	34 (12.3%)

5.6 Associated factors

On multivariate analysis for possible associated factors for this individual attitude parameter, the fact that HCWs gained their information from more reliable sources was almost four times more potent to make them believe in PPEs. (P=014, AOR; 3.86, 95%CI 1.318;11.355) In addition, HCWs who are medical doctors are more likely to have the exposure to update lectures and webinars than nurses and other HCWs. (p=0.000; COR 5.3, 95%CI 2.7-10.2) However, further associations couldn't be extracted.

Discussion

Corona virus disease 19 has been an ongoing global threat since the very beginning of the ending year 2020. Although there are much more known things in comparison to the beginning of the pandemic, the world is still under constant waves of uncertainties leaving heath care professionals at even more higher risks on daily bases than the general population. The risk of contracting the disease among heath care givers further enhances if it is accompanied by poor knowledge, attitude and practices of PPEs. Hence, it has a paramount importance to determine presence of these risk enhancers especially in low resourced setups in order to mitigate spread of this infection.

The findings from the current study showed that majority of participant HCWs were from the age range of 20-29 years of age with mean age of 30 years. Majority of responders were males (57%). These findings are comparable with studies conducted in other parts of Africa. On similar Nigerian study the researchers reported mean age of HCWs were 32.3 ± 9.9 years (5) However, other studies done to see KAP in general COVID-19 disease reported the highest proportion of HCWs being in these age group with slightly higher mean age (34.9±9.3 years) and Male predominance (50%). (6) On the other hand, another Nigerian study reported highest proportion in age range of 31-40years. (7)

Overall medical doctors comprised of 203 (73.2%) of the participants which was higher than reported from other studies 144 (48%), however proportions of resident doctors was just 143 (70.5%) which as similar with reports from Nigeria 102 (70.8%).(7) This findings are higher than the others and where majority of the respondents were medical doctors (n=114, 41.9%). (5)

The result from current study demonstrates 52.2% had some form of IPC training which is similar with Nigerian study (n=130, 47.8%) where in person class room trainings was commonest means of trainings.(5)

The average knowledge, attitude and practice proportions of HCWs gained from this were 73.9%, 40.3% and 57.7% respectively. In Nigeria reported attitude toward PPE use was very low (14.5%) urging nationwide practical training on PPE use. (5) Ugandan study demonstrated knowledge, attitude and practices being 69%, 21% and 74% respectively. (7)

Institutional-based cross sectional study from Gonder, Ethiopia was done to evaluate practice of preventive strategies against COVID-19. The result showed poor preventive practices among HCWs which was found to be around 38.7%. Knowledge and attitude among HCWs were 64% and 70% respectively. (8)

These differences might be as a result of different involvement of infection rates among Gonder and Addis Ababa where the number of daily infected people are higher putting HCWs at higher fear of contracting the disease hence higher complaint with applications of PPE application. It can be further strengthen by the fact that only 36% of HCW at Gonder reported consistent use of facemask at work pace where in our study 55% of HCWs reported consistent use of face mask all the time. (8)

Although difficult to compare with other similar studies, in this study some PPEs like N95 masks seems to be more required by HCWs and misused as compared to others means of protection.

Conclusion

The current study was able to demonstrate three quarters of HCWs had a good knowledge. Less than half of them had positive attitude. The practice levels of PPE use among HCWs were slightly more than 50%. There are high demand for N95 masks but poor knowledge and practice.

Majority of the responders didn't have COVID-19 specific training despite having a good background of infection prevention control training.

In regard to applying PPEs most of the HCWs are not confident in applying them and tend to make mistakes frequently during donning and doffing.

Limitations of the study

This study uses conventional sampling which can introduce selection bias into the study participants. The number of participants from EKGH were also limited due to small response rate. This can limit conclusions to the larger represented hospital which is TASH.

The other limitation could be assessment tools for individual questions were not designed and calculated based on standard Liker scale. This can be a short coming because overall mean scores of individual parameters were difficult to compute.

Recommendations

In an attempt to addressing gaps identifying regarding knowledge and attitude, with involvement of expertise in pioneer institutions like TASH where continuous medical education are circulating, it would be helpful to implement refreshing training programs and inclusive updates for HCWs.

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ANNEX1

Participants consent form

Dear study participant,

I would like to thank for your participation in this study on knowledge, attitude and practice of use of personal protective equipment (PPE) on health care workers (HCWs) that are currently working at TASK and EKA Kotebe hospitals, Addis Ababa.

TITLE OF THE STUDY: A cross sectional study on KAP of HCW towards PPE use.

RISK OF THE STUDY: There is no risk associated with participating in the study.

COMPENSATION: There will be no compensation given.

RIGHT TO WITHDRAW: Your participation in this study is voluntary. You are free to decline it, without any consequences. You also have the right to change your mind anytime without any consequences.

CONFIDENTIALITY: Your identity will remain absolutely confidential. The answers obtained will be documented and analyzed anonymously. Only researchers will have access to personal information. The researcher's aim for this study is purely academic and scientific purposes. If you have any questions about the study, contact: Dr Kalkidan Chala on 0930-65-17-17. Before you were involved in this study, I kindly request you to sign the consent form below. You are free to ask any questions before signing the consent form.

Signature _____

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ይህ ጥናት የሚካሄደው በጥቁር አንበሳና በኤካ ሆስፒታሎች ውስጥ በሚሰሩ የጤና ባለሙያዎች ላይ ነው።የጥናቱዓላማ የኮቪድ 19 ወረርሽኝን ለመከላከል የምንጠቀምባቸው መከላከያ ቁሳቁሶችን አስመልክቶ ነው።በዚህ ጥናት በመሳተፍዎ የሚያድርስብዎት ተጽኖ አይኖርም።

በጥናቱላይከመሣተፎበፊትማንኛዉምጥያቄካሎትጥናቱንለሚያደርገዉግለሰብበዚህስልክቁጥርደዉለዉይጠይቁ፣ ዶ/ር ቃልኪዳን፤ 0930-65-17-17.

ጥናቱላይከተሳተፉበኋላበማንኛዉምጊዜከጥናቱያለምንምችግርመዉጣትይችላሉ

በዚህጥናትላይለመሣተፍከተስማሙበፊርማዎትያረጋግጡ።

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ANNEX –II

Questionnaire

Structured self-administered questionnaire on Knowledge, attitude and practice (KAP) of personal protective equipment (PPE) use against COVID-19 among health care work (HCW) in Tikur Anbessa specialized hospital (TASH) AND EKA KOTEBE Hospitals, Addis Ababa, Ethiopia.

Part 1. Socio-demographic status		
1	Age (In years)	_____
2	Sex	☐ Male ☐ Female
3	Where do you work currently? (TASH includes working in affiliated hospitals as well)	☐ TASH ☐ EKA Kotebe
4	If you are working in TASH, are you an academic staff?	☐ Yes ☐ No
5	What is your Profession	☐ Sub-specialist ☐ Specialist ☐ Resident ☐ General practitioner ☐ Intern ☐ Nurse ☐ Medical Laboratory profession ☐ Pharmacy profession ☐ Other _____
6	If you are a Resident, please specify	

	year of training	_____
7	If you are working at TASH, in which department are you practicing?	□ Internal medicine □ Emergency medicine □ Neurology □ Surgery □ OB/GYN □ Pediatrics □ Radiology □ Psychiatry □ Other _____
8	Work experience as a Health care professional (in Years)	_____
9	In which clinical units are you working currently? (if clinical rotation applies, please select every area applies to your practice)	□ ER/Triage unit □ OPD □ Wards/Inpatient □ ICU □ Medical Lab □ Pharmacy □ Other _____
10	Do you have additional private part time practice?	□ Yes □ No
11	Have you worked/are you working in COVID-19 treatment center/Covid treating hospital?	□ Yes □ No
12	If you are working at TASH, have you ever worked/are you working in Covid isolation units?	□ Yes □ No
13	Average work hour per day in the previous month	_____

14	Have you ever had any training on Infection prevention control (IPC) in your experience?	□ Yes □ No
15	Have you ever had training on IPC specific to PPE use in prevention of COVID-19?	□ Yes □ No
16	If Yes, what was the mode of training?	□ Online (Webinar) form training □ On job training □ In person class room seminar □ Training on social media platform □ Other _____
17	What is your usual source of information (go to reference) regarding rational utilization of personal protective equipment?	□ Update lectures and webinars □ Persona; reference to standard guidelines □ News □ Social media □ Discussions among friends □ Others _____
18	Did you have COVID-19 infection so far?	□ Yes □ No

Part 2. Knowledge on proper PPE use		
1	What are the most important precautions used to prevent transmission of COVID-19 through droplet mechanism? (please select every answer applies)	□ Eye protection (google and face shield) □ Wearing surgical masks □ Wearing N95 mass during procedures □ Maintaining physical distance Wearing gloves and long sleeved disposable

		gown □ Isolate patients in separate area Standard frequent hand washing /alcohol hand rub □ Other _____
2	What are the most important precautions to prevent transmission of COVID-19 through contact mechanism? (please select every answer applies)	□ Eye protection (google, face shield) □ Wearing surgical masks □ Wearing N95 mass during procedures □ Maintaining physical distance □ Wearing gloves and long sleeved disposable gown □ Isolate patients in separate area □ Frequent hand washing /alcohol hand rub □ Other _____
3	What are the most important precautions to prevent transmission of COVID-19 through airborne mechanism?	□ Eye protection (google, face shield) □ Wearing surgical masks □ Wearing N95 mass during procedures □ Maintaining appropriate physical distance □ Wearing gloves and long sleeved disposable gown □ Isolate patients in separate area □ Standard frequent hand washing/alcohol hand rub □ Other _____
4	During aerosol generating procedures (Non-invasive and invasive ventilation, intubation, bronchoscopy, tracheostomy, CPR), What do you think is the appropriate use of PPE?	□ Contact + aerosol + droplet preventive mechanisms □ Droplet + aerosol preventive mechanisms □ Aerosol and contact preventive mechanism □ Aerosol preventive mechanism only

5	Is it appropriate for health care workers wear surgical masks while working within 1m of patient care?	□ Very appropriate □ Somehow appropriate □ Not appropriate □ I don't know
6	Do you think all HCWs should wear N-95 respirators all the time in the hospitals?	□ Strongly agree □ Agree □ Neutral □ Disagree □ Strongly disagree

Part 3. Attitude on PPE use		
1	Do you believe PPE protect against COVID 19?	□ Yes □ No □ May be
2	To what extent do you feel that these protective measures and equipments protect you from contracting the disease?	□ Always □ Most of the time □ Some times □ Occasionally □ Rarely □ Not at all
3	Do you believe currently available PPE is standard quality ?	□ Yes □ No □ May be
4	If NO or may be is your answer, which PPE items may have less standard quality?	□ N-95 Mask □ Surgical mask □ Face shield/google □ Full body cover gown □ Other _____
5	Do you think your institution provides you with enough PPE?	□ Yes □ No □ May be

6	If no, Which of the PPE items are among the list of shortage that you think should have been provided more based on rational PPE use?	☐ N95 masks ☐ Surgical masks ☐ Googles and face shields ☐ Gloves ☐ Long sleeved gowns ☐ Other _____
7	Do you feel your institution is using appropriate guidelines on the rational use of PPE?	☐ Yes ☐ No ☐ May be
8	Do you think HCWs use PPE rationally?	☐ Yes ☐ No ☐ May be ☐ I don't know
9	Do you think training on rational use of PPE can bring better PPE use among HCWs?	☐ Yes ☐ No ☐ May be ☐ I don't know
10	Do you think you have enough knowledge to care for COVID-19 Patients?	☐ Yes, I am confident ☐ Somehow confident ☐ Not confident ☐ Other _____
11	Do you know any HCWs who avoids contact with patient, either physical exam/nurse visit to avoid infection with COVID-19?	☐ Yes ☐ No ☐ I don't know
12	In which circumstances do you think HCW should avoid contact (Physical exam/nurse visit) with their patient?	☐ Patient is suspected/confirmed to have COVID and no adequate PPE ☐ Every suspected patient regardless of PPE use ☐ Every patient due to unknown status ☐ Other _____

Part 4. Practice on use of PPE		
1	When do you use surgical masks?	□ Every time I see a patent □ Inside hospital compound □ In the community □ Other _____
2	When do use N95 masks?	□ Every time I see a patient □ Working at COVID Isolation/treatment centers □ Working at ICU □ Ding/assisting aerosol generating procedures □ Other _____
3	When do you use Face shield/googles?	□ Every time I see a patient □ Working at COVID Isolation/treatment centers □ Working at ICU □ Doing/assisting aerosol generating procedures □ Other _____
4	On average, how many times do you re-use your N95 masks before discarding it?	_____
5	What standard precaution do you use to disinfect your N-95 mask?	□ Keep it in a plastic bag □ Use of UV light □ Fumigation □ Hot steam □ Other _____
6	How frequent do you use face shield and googles in clinical practice?	□ Frequently □ Sometimes □ Occasionally

		□ Rarely
7	Do you feel confident in applying PPE on every day bases?	□ Yes □ No □ May be
8	How often do you make mistakes regarding donning and doffing?	□ Always □ Often □ Sometimes □ Rarely □ Never
9	Do you feel following strict rules in removing PPE (Doffing) is mandatory?	□ Yes □ No □ May be