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Family Medicine

Awareness between Doctors and Nurses to Protect Themselves during COVID-19 Pandemic

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Abstract **Original Research Article**

To date, there are more than 207 million confirmed cases and more than 4.3 million deaths reported worldwide. Given the high transmissibility and modes of transmission of SARS-CoV-2, healthcare workers (HCWs) are required to continue using maximum barrier precautions with personal protective equipment (PPE). Infection control and prevention is an integral component of the healthcare system in any setting to reduce risks for morbidity and mortality in patients and healthcare professionals at all levels. Healthcare professionals have a great responsibility for infection risk reduction in patients across the entire continuum of care and through a variety of direct care activities, especially during the highly contagious COVID-19 pandemic. ***Aim:*** This cross-sectional study was designed to assess awareness of COVID-19 disease and its related infection control practices among healthcare workers. ***Design:*** An online self-reported cross-sectional survey was designed to assess awareness and recent training of HCWs about common IPAC (Infection Control and Prevention) measures necessary in dealing with droplet infection. All HCWs involved are working in facilities dealing with suspected or confirmed COVID-19 cases. A total number of 1347 HCWs, working in facilities dealing with suspected or confirmed COVID-19 patients responded to the survey in various countries. Descriptive and analytic statistics were performed for all groups and subgroups based on their responses. ***Results:*** We found that 949 of the participants work in healthcare facilities dealing with COVID-19 patients. Around 52.5% of them performed N95 respirator fit testing while around two third of them received recent PPE and hand hygiene training. We also found that 837 HCWs reported providing direct service to COVID-19 patients and 52.5 % of them performed N95 respirator fit testing while around 62.5% of them received PPE training and 59.9% of them received hand hygiene training. We set a total score of 70% as a passing score for our survey. We found that 55.4% of HCWs (n=746) were able to achieve similar or higher scores, while 44.6% of HCWs (n=601) did not achieve it. ***Conclusion:*** There is a need for continuous education and training programs on infection control.

Keywords: COVID-19, SRAS CoV-2, healthcare workers, infection control, personal protective equipment.

INTRODUCTION

According to World Health Organization, 2020, Coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first reported in December 2019. Several countries have now reported community spread and the World Health Organization (WHO) declared coronavirus disease as a pandemic on March 11, 2020, which clearly spread to all countries around the globe thereafter [1]. This began in late December 2019 in Wuhan City as an emergent pneumonia outbreak that originated and was considered a major general public health problem crisis for the entire world [2]. On January 8, 2020, (The Chinese Centre for Disease Control and Prevention) officially announced the novel coronavirus as the causative virus of 2019-nCoV [3]. On January 30, 2020, the WHO announced international concern about this infectious disease as an outbreak [4]. Initially, the novel coronavirus was named officially Severe Acute Respiratory Syndrome Coronaviru-2 (SARSCoV-2) On the 11th of February 2020, the novel viral pneumonia was named by WHO "CoronaVirus Disease (COVID-19)", while the International Committee on Taxonomy of Viruses (ICTV) reported this novel-coronavirus name as "SARSCoV-2" because of the taxonomic analysis and phylogenetic of this novel-coronavirus [5]. Clinical symptoms of novel coronavirus were different

from Severe Acute Respiratory Syndrome (SARS) caused by SARS Coronavirus (SARS-CoV) which appeared in (2002-2003), recently reported that a new human-to-human infectious agent transmission caused an outbreak of this developing viral pneumonia [3, 6]. Novel coronavirus has been quickly isolated and sequenced its genome (29,903 nucleotides) [7]. Finally, viral pneumonia happening in Wuhan was identified as a novel coronavirus (2019-nCOV) [8]. Previous, outbreaks of respiratory disease caused by these viruses seem to have originated in animals before moving into other hosts like humans. MERS-CoV was found to be transmitted from Arabian camels to humans, whereas SARS-CoV was transmitted from civet cats to humans. SARS-CoV-2 seems to have originated from bats and the first reports of cases were from Wuhan, Hubei Province in China, suggesting an animal-to-person spread from a live animal market. The virus then spread outside Hubei and subsequently, to the rest of the world via human transmission [9]. With this mode of transmission, healthcare workers are at the highest risk of being infected [10]. COVID-19 virus is highly contagious with an additional hazard for the healthcare system apart from the burden of extended work hours, physical and psychological burnout, fatigue, and stress which has been associated with increased mortality among doctors and healthcare workers [11-13].

Shortages of PPE supply and the inability to meet the demands of rising COVID-19 hospitalizations required rationing of essential PPE gear, including N95 respirators, surgical masks, and face masks. This shortage demanded that healthcare workers understand the indications for various components of PPE with respect to different levels of precautions, in addition to correctly wearing PPE to prevent the spread of infection. Limited access to PPE in the context of a worsening pandemic placed greater emphasis on the importance of PPE use and compliance with safety and infection prevention measures [14]. Our cross-sectional study was designed to evaluate and assess awareness of COVID- 19 disease and its related infection control practices and measurements among healthcare professionals' scenarios. Until an effective cure/vaccine is developed, risk assessments at work, mitigating confounding factors, adequate supply of personal protective equipment (PPE), and enhanced protection against infection are necessary to protect healthcare professionals on the coronavirus frontline. This questionnaire-based survey was adapted and based on WHO and the US Centres for Disease Control and Prevention (CDC) interim guidelines for healthcare personnel provided.

SUBJECTS AND METHODS

An online self-reported cross-sectional survey was designed to assess awareness and recent training of HCWs about common IPAC (Infection Control and Prevention) measures necessary in dealing with droplet infection. All HCWs involved are working in facilities dealing with suspected or confirmed COVID-19 cases. The data of participants was kept anonymous and confidential. The survey was divided into 4 sections: (1) general idea and consent to participate, (2) demographic data, (3) assessment of prior HCWs' knowledge and training about IPAC principles held by their organizations, (4) assessment of HCW knowledge about various IPAC measures including 10 different questions. 70% or more of the total score was considered a "pass" score based on the US Centres for Disease Control and Prevention (CDC) interim guidelines for healthcare personnel provided. The survey was made available online in the period between 1st May and 31st December 2022.

Statistical Analysis

The sample size of participants is calculated with a confidence level of 95% and a margin of error within ± 5% of the surveyed values [15]. The Chi-square χ^2 test was used for the comparative analysis of categorical variables with $P \leq 0.05$ which was considered to be statistically significant. We collected 1424 responses to the survey including duplicate responses (n=26), and those who refused to enrol (n=51). We ended up with 1347 valid responses. Validated data was tabulated, entered, and analysed using Statistical Package for the Social Science (SPSS), version 21.0 (SPSS Inc. Chicago, IL, USA).

RESULTS

1. Demographic Data

Following the consent to participate in this study, we started with an exploration of the demographic characteristics of our respondents. A total number of 1347 HCWs, working in facilities dealing with suspected or confirmed COVID-19 patients responded to the survey from various countries as shown in Figure 1.

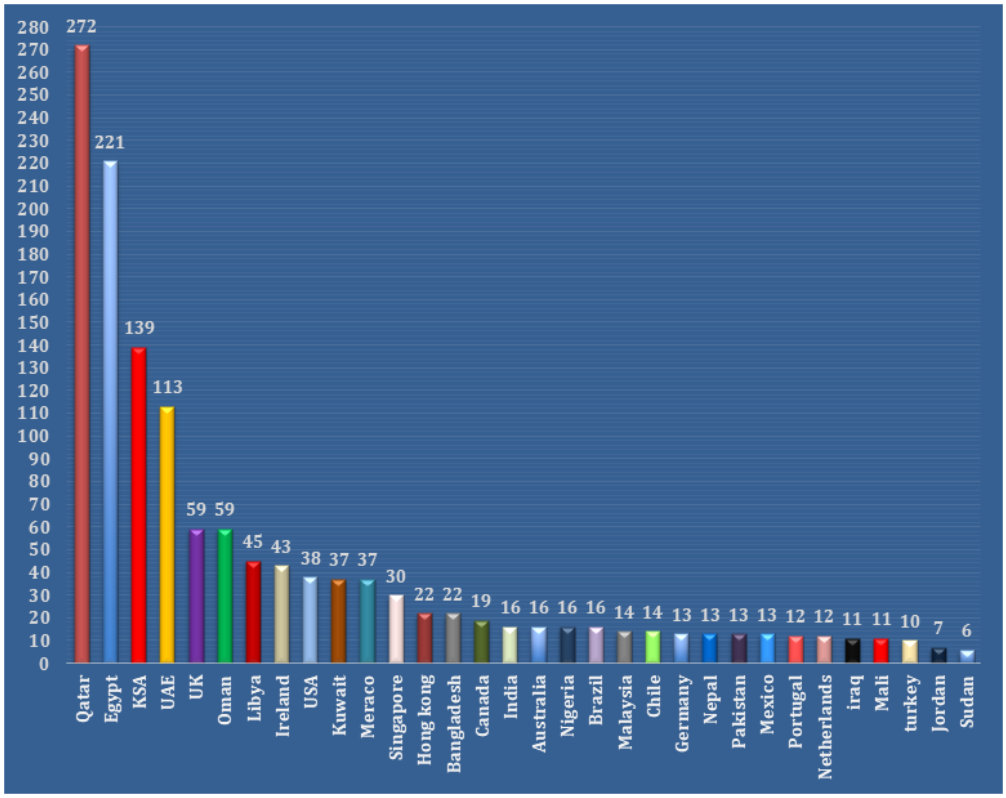

Fig. 1: Distribution and numbers of participants according to their country of residence

Demographic data shows participants belong to different age groups with about 65.6% (n=884) as males and 34.4% (n=463) as females. As for the age groups of participants, 13% of them were below 30 years old (n=175), 38% of the participants' ages were between 30-39 years old (n=514), participants with ages between 40-49 years old 37% of the total (n=499), and those with ages from 50 or above years old were 12% (n= 159) as in Fig 2.

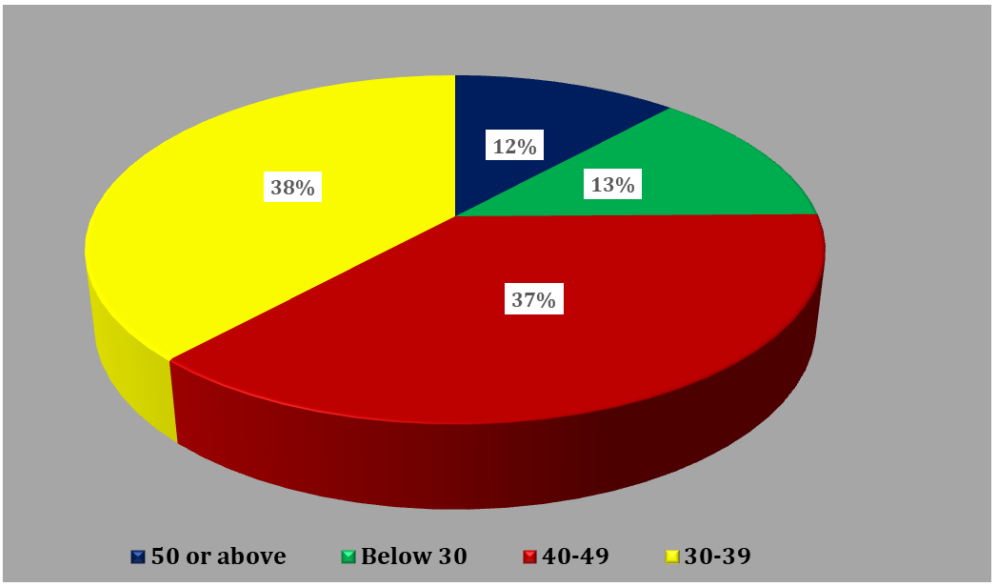

Fig. 2: Distribution of age group characteristics of HCWs participating in the survey

Many participants with different workplace characteristics contributed to our survey including different occupations (physicians, dentists, and nurses), and different years of experience at work as shown in Fig 3.

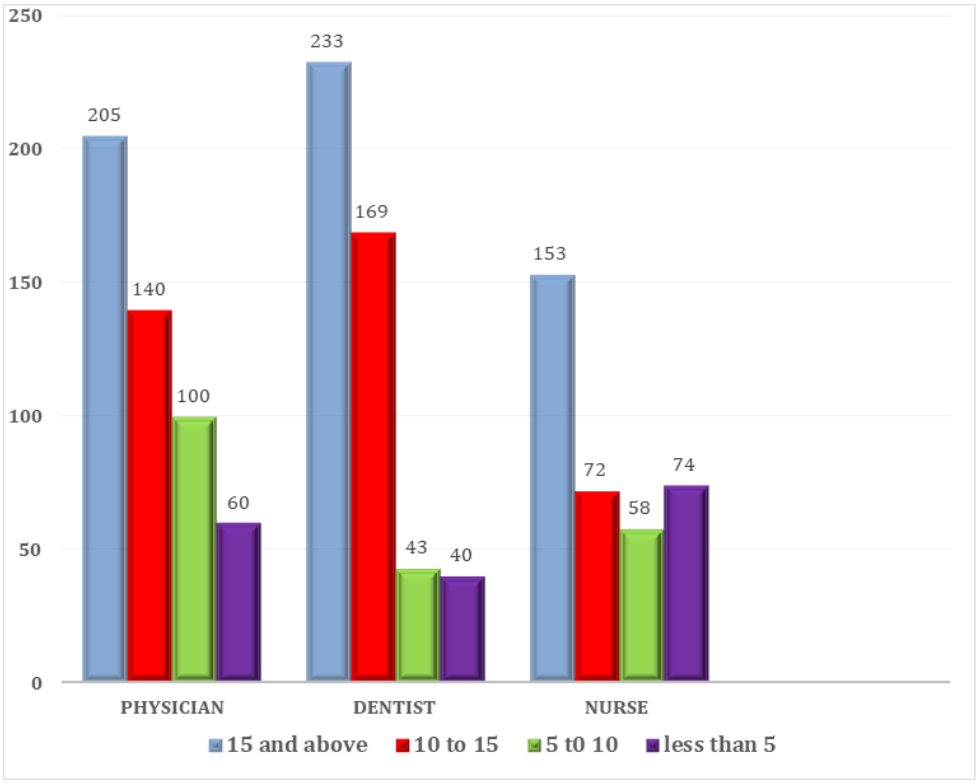

Fig. 3: Distribution of occupational characteristics of HCWs participating according to work experience (year) in the survey

2. Assessment of Prior HCW Knowledge and Training about IPAC Principles Held by Their Organizations:

In this part of the survey, we tried to explore whether participants work in or deal with suspected COVID-19 cases and we found that 70.5% of participants work in places that offer service for suspected or confirmed COVID-19 cases (n=949) and around 62.1% (n=837) of participants get in direct contact with suspected or confirmed COVID-19 cases. In dealing with participation in infection control training, we found that 52.4% of participants performed the N95 fit test recently (n=707) in their institution during the last year and 59.9% of participants received formal hand hygiene training from their institutes (n=807) while 62.5% of them received formal PPE training (n=842) as shown in Fig. 4.

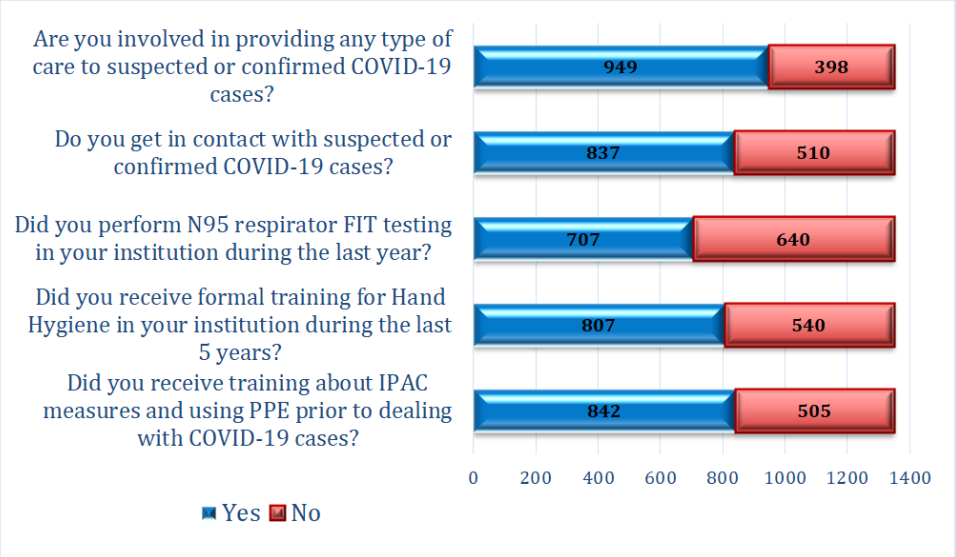

Fig. 4: Participants' responses about IPAC measures and training in their workplace

3. Assessment of HCW knowledge about various IPAC measures

In this section of the survey, we started with assessing the subjective perception of participants about their knowledge regarding infection control measures for droplet infections. That was assessed on a 5-point Likert scale and results were demonstrated in Fig. 5.

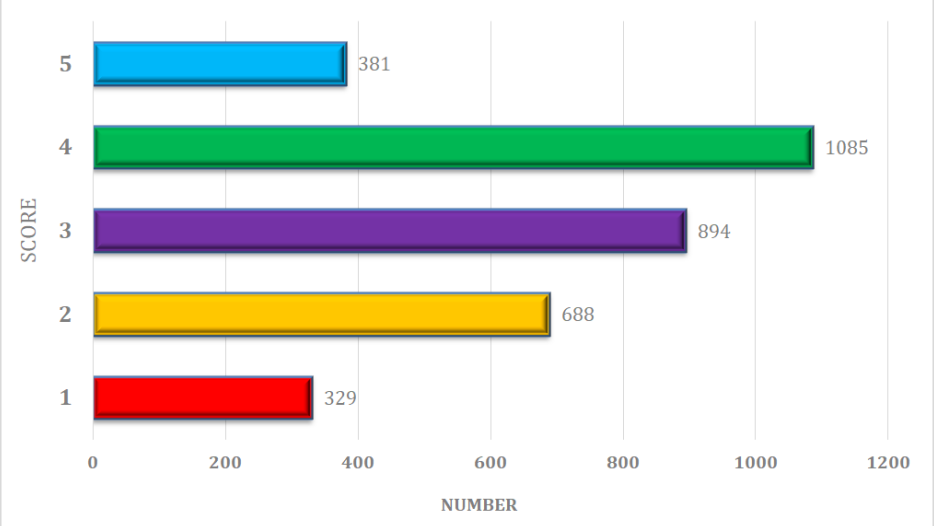

Fig. 5: Subjective perception of participants about their knowledge regarding infection control measures for droplet infections

We considered 70% of correct answers for each question to be an adequate indicator of awareness of HCW about this item. Regarding common infection control principles, we found that participants showed an adequate number of correct responses to the questions related to usual hand hygiene, initial measures to deal with suspected/ confirmed COVID-19 cases, PPE, and performing Aerosol Generating Procedures GP). On the other hand, inadequate numbers of correct responses appeared in questions related to the following items: hand hygiene of visibly soiled hands, donning and doffing of PPE, and others as shown in Table 1.

Table (1): Survey questions and the number of accurate/inaccurate responses

Survey Question	Accurate responses, N %		Inaccurate responses, N %	
Are gloves used for dealing with suspected or confirmed COVID-19 cases should be always sterile gloves?	799	59.3	648	40.7
When should you perform hand hygiene?	1054	77.6	293	22.4
If your hands get VISIBLY soiled, what is the best way to clean them?	801	59.5	546	40.5
If a healthcare professional is involved in the care of a suspected or confirmed COVID-19 case, what PPE should he wear?	1347	100	0	0
If a healthcare professional is involved in the care of an ASYMPTOMATIC CONTACT of a confirmed COVID-19 case, what PPE should he wear?	1002	74.4	345	25.6
Which of the following is recommended for the isolation of confirmed, or suspected COVID-19 cases under investigation?	446	33.1	901	66.9
Which of the following is a recommended infection control measure upon arrival of a suspected COVID-19 case?	1003	74.5	244	25.5
A recommended infection control and prevention measures are to perform an Aerosol Generating Procedure (AGP), including a collection of respiratory specimens, in an airborne infection isolation room?	1043	77.4	304	22.6
What is the proper sequence of PPE donning?	306	22.7	1041	87.3
What is the proper sequence of PPE doffing?	456	33.9	891	66.1

We set a total score of 70% as a passing score for this survey. We found that 55.4% of HCWs (n= 746) were able to achieve similar or higher scores, while 44.6% of HCWs (n=601) did not achieve it as shown in fig. 6.

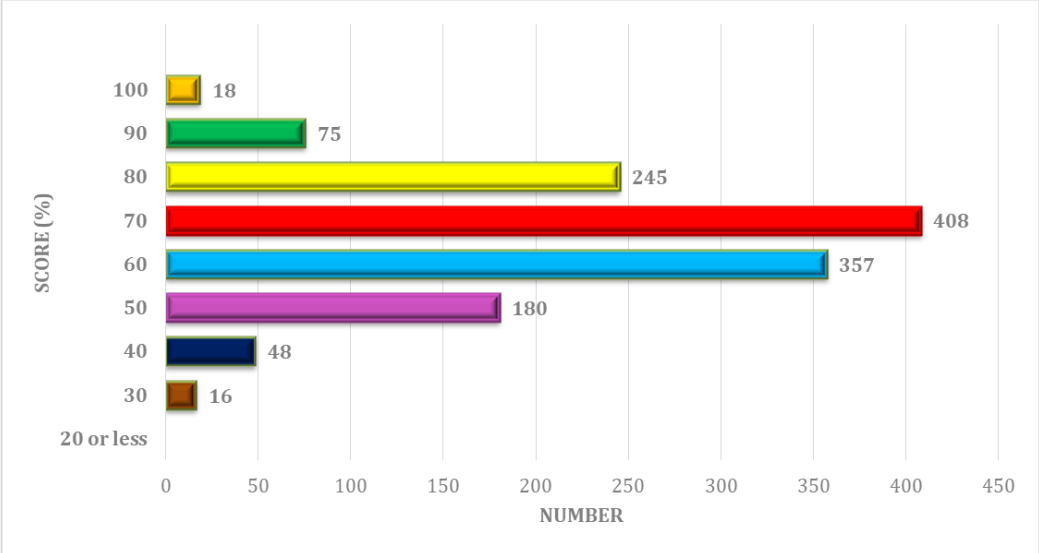

Fig. 6: Distribution of scores of survey achieved by HCWs participating in the survey as a percentage of the total mark

Analysis of data related to pass or fail rates of the questionnaire about demographic and occupational characteristics revealed that there was a significant difference in pass rate in relation to age ($p< 0.001$) being lower in the age group below 30 years. We also found a significant difference in pass rate in relation to gender and job ($p< 0.05$). However, there was no significant difference in relation to the duration of the experience ($p> 0.05$) as shown in table 2.

Table (2): Distribution of pass/ fail rates in relation to demographic and occupational characteristics of HCW participating in the survey

PARAMETER	PASS		FAIL		P
	N	%	N	%	
AGE (YEAR)					**<0.001**
BELOW 30	62	35.4	113	64.6	
30-39	356	69.3	158	30.7	
40-49	224	44.9	225	55.1	
50 AND ABOVE	104	65.4	55	34.6	
SEX					**0.0452**
MALE	438	58.7	311	51.7	
FEMALE	308	41.3	290	48.3	
EXPERIENCE (YEARS)					**0.46**
LESS THAN 5	59	50	58	50	
5-9	141	62.7	93	37.3	
10-14	234	52.8	171	47.2	
15 AND ABOVE	312	52.8	279	47.2	

DISCUSSIONS

The most effective preventive strategy against COVID-19 is the stringent and effective use of personal protective equipment (PPE). In early April, when the outbreak was exponentially increasing in magnitude in Europe, concerns regarding a lack of PPE were voiced by healthcare professionals across multiple countries in the continent [16, 17]. Soon, the lack of numbers of PPE was managed by the development of effective reuse methods and an increase in the production capacity of PPE [13]. In our study, we evaluated the HCWs' knowledge of various infection control information according to the Interim Infection Prevention and Control Recommendations for patients with suspected or confirmed coronavirus disease 2019 (COVID-19) in healthcare settings that have been issued by CDC [18]. In this study, we found that 70.5% of HCWs provided direct service to COVID-19 patients. 62.1% of the total participants in this study get in contact with suspected or confirmed COVID-19 cases or provide medical services for them while 59.9% of participants received formal hand hygiene training from their institutes, 62.5% of them received formal PPE training and 52.5% of them performed the N95 fit test recently. On the other side, 29.5% of participants do not work in healthcare facilities dealing with COVID-19 patients. 47.6% of those HCWs did not perform N95 respirator fit testing. However, 37.5% of participants

did not receive recent PPE training, and 40.1%of them did not receive formal hand hygiene training. Hand hygiene has been considered the most critical measure for reducing the cross-infection transmission risk to patients [19-21]. Our cross-sectional study showed lower knowledge and pass rates in relation to younger age groups, especially those below 30 years ($p< 0.001$), and a significant difference in knowledge and pass rates in relation to gender being lower among female HCWs ($p< 0.05$). This goes with what was concluded in a cross-sectional study in Qatar regarding (In the Middle of the COVID-19 Pandemic: Do Healthcare Workers Know enough to protect themselves?) [22].

Our results showed that 62.5% of HCWs have adequate knowledge about IPAC measures while 37.5% did not. This is slightly lower than what was found in the study of healthcare professionals and students' awareness from the Mumbai Metropolitan Region with an overall awareness of 71.2% of participants [23]. On the other side, our results are higher than what was found in a similar survey carried out in Nigeria to assess their knowledge, and attitudes about the use of PPE among HCWs for SARS-CoV-2 prevention which showed that adequate knowledge about PPE was available only 25.7% of the HCW responders from different branches including medical doctors, nurses and clinical students [24] and in another study which was 53% between HCWs that done in Qatar [22].

CONCLUSION

Our study reveals that there is a gap in knowledge of infection control practices for COVID-19 across all healthcare professions, especially among young and female HCWs. Even though there is a high possibility that they get in contact with patients at some point in the healthcare process and are therefore at risk of contracting and spreading the infection.

RECOMMENDATION

Conducting periodic educational activity interventions for all healthcare professionals where could be a helpful and safe tool to create proper awareness of infection control. This periodic activity should be targeted toward certain HCWs especially young and female HCWs categories.

CONFLICT OF INTEREST

The authors declare that they do not have any financial interest, arrangement, or affiliation with anyone in relation to this research that could be perceived as a real or apparent conflict of interest in the context of the subject of this study.

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