

## In the Middle of the COVID-19 Pandemic: Do Healthcare Workers Know enough to Protect Themselves?

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### Abstract

### Original Research Article

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 professionals. **Design:** An online self-reported cross-sectional survey was designed to assess awareness and recent training of HCW about common IPAC (Infection Control And Prevention) measures necessary in dealing with droplet infection. All HCW involved are working in facilities dealing with suspected or confirmed COVID-19 cases. A total number of 449 HCW, 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 344 of participants work in health care facilities dealing with COVID-19 patients. Around 60% of them performed N95 respirator fit testing while around three quarters received recent PPE and hand hygiene training. We also found that 310 HCW reports providing direct service to COVID-19 patients and 35.5 % of them performed N95 respirator fit testing while around 82% of them received PPE and hand hygiene training. We set a total score of 70% as a passing score of our survey. We found that 53% of HCW (n= 242) were able to achieve similar or higher scores, while 47% of HCW (n=207) did not achieve it. Conclusion: There is a need for continuous educational and training programs on infection control.

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

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## INTRODUCTION

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 on the globe thereafter [1]. This began in the late December 2019 in Wuhan City as an emergent pneumonia outbreak which originated and was considered a major general public health problem crisis for the entire world [2]. On January 8, 2020, (Chinese Centre for Disease Control and Prevention) officially announced novel coronavirus as the causative virus of 2019-nCoV [3]. On January 30, 2020 the WHO announced for international concern of this infectious

disease as an outbreak [4]. Initially, the novel coronavirus was named officially as Severe Acute Respiratory Syndrome Coronavirus-2 (SARSCoV-2) On the 11th of February 2020, the novel viral pneumonia was named by WHO as “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]. This novel coronavirus clinical symptoms were different from Severe Acute Respiratory Syndrome (SARS) caused by SARS Coronavirus (SARS-CoV) which appeared in (2002-2003), recently reporting that a new human-to-human

infectious agent transmission has caused outbreak of this developing viral pneumonia [3,6]. Novel coronavirus has been quickly isolated and sequenced its genome (29,903 nucleotides) [7]. Finally, the viral pneumonia happening in Wuhan was identified as a novel coronavirus (2019-nCoV) [8]. 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 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 among the highest risk of being infected [10]. The highly contagious COVID-19 virus is an additional hazard for the healthcare system apart from the burden of extended work hours, physical and psychological burnout, fatigue and stress [11,12]. COVID-19 has been associated with an increased mortality in doctors and health care workers [13]. For this reason, our cross-sectional study was designed to evaluate and assess awareness toward COVID-19 disease and its related infection control practices and measurements among healthcare professional's scenario. 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 health care 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

HCW about common IPAC (Infection Control and Prevention) measures necessary in dealing with droplet infection. All HCW involved are working in facilities dealing with suspected or confirmed COVID-19 cases. The data of participants who agreed to enroll 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 HCW knowledge and training about IPAC principles held by their organizations, (4) assessment of HCW knowledge about various IPAC measures including 10 different questions. A score of 70% or more was considered as 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 June and 1<sup>st</sup> August 2020.

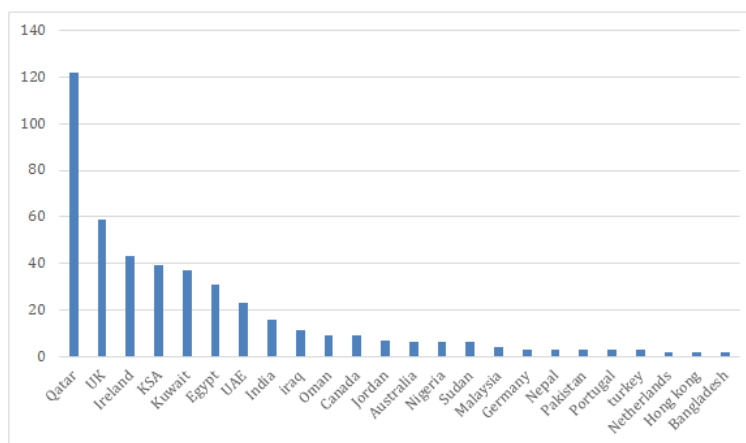
## STATISTICAL ANALYSIS

We aimed for a target sample size of at least 383 participants to ensure a confidence level of 95% and margin of error within  $\pm 5\%$  of the surveyed values [14]. We collected 461 responses to the survey including duplicate responses ( $n=7$ ), and those who refused to enroll ( $n=5$ ). We ended up with 449 of 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). Chi-square  $\chi^2$  or Fisher Exact test was used for comparative analysis of categorical variables.  $P \leq 0.05$  was considered to be statistically significant.

## RESULTS

### 1. Demographic data

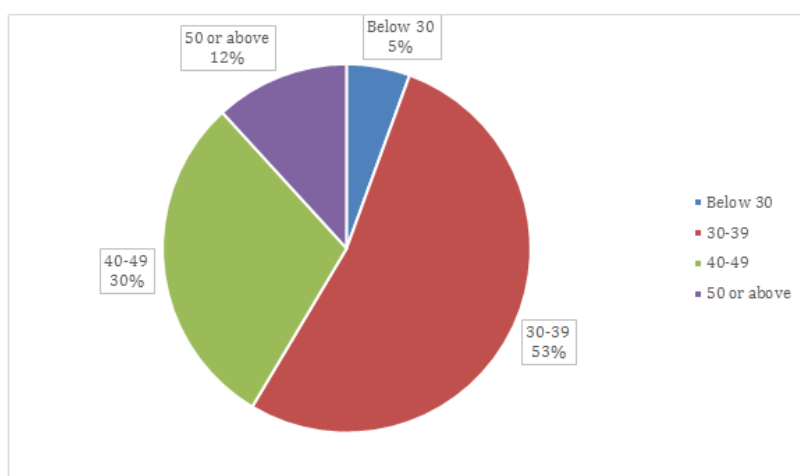
Following the consent to participate in this study, we started with exploration of the demographic characteristics of our respondents. A total number of 449 HCW, working in facilities dealing with suspected or confirmed COVID-19 patients responded to the survey from various countries as shown in Figure 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 61% (n=274) as males and 39% (n=175) as females. As for the age groups of participants, 5% of them were below 30 years old (n=25), more than half of participants' age was

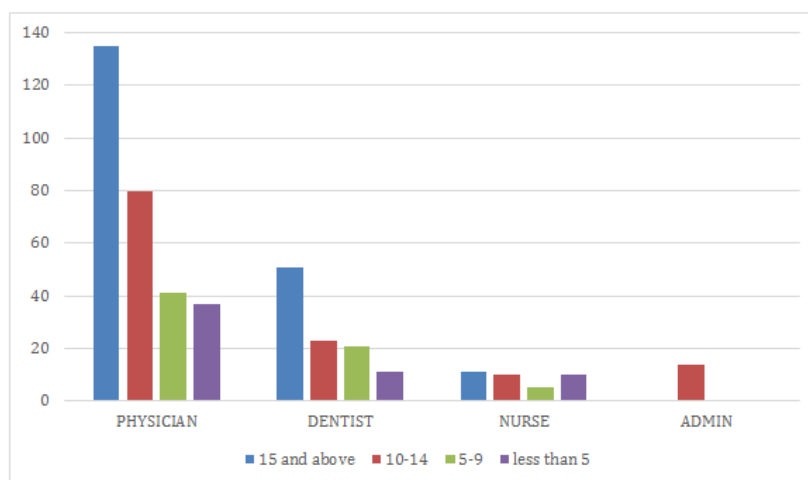
between 30-39 years old (n=238), participants with ages from 40-49 years old were less than one third of total (n=133), and those with ages from 50 or above years old were 12% (n= 53) as in Fig 2.



**Fig-2: Distribution of ages group characteristics of HCW participating in the survey**

Many participants with different workplace characteristics contributed to our survey including different occupations (physicians, dentists, nurses and

administrative jobs), and different years of experience at work as shown in Fig 3.

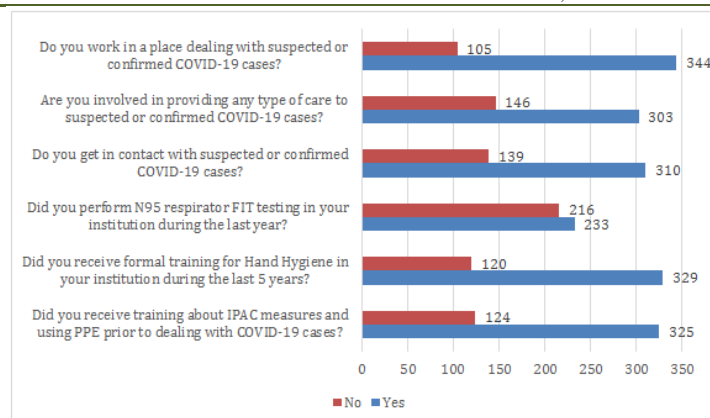


**Fig-3: Distribution of occupational characteristics of HCW participating according to work experience (year) in the survey.**

**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 76.6% of participants work in places that offer service for suspected or confirmed COVID-19 cases (n=344) and

around 70% of participants get in contact with those patients or provide service for them. As for past and recent participation in infection control training, we found that 73% of participants received formal hand hygiene training by their institutes (n=329) while 72% of them received formal PPE training (n=325) and almost half of them performed the N95 fit test recently (n=233) as shown in Fig. 4.



**Fig-4: Participants’ responses about IPAC measures and training in their workplace.**

We found that 344 of participants work in health care facilities dealing with COVID-19 patients. Around 60% of them performed N95 respirator fit testing while around three quarters received recent PPE and hand hygiene training. We also found that 310

HCW reports providing direct service to COVID-19 patients and 35.5 % of them performed N95 respirator fit testing while around 82% of them received PPE and hand hygiene training as shown in table 1.

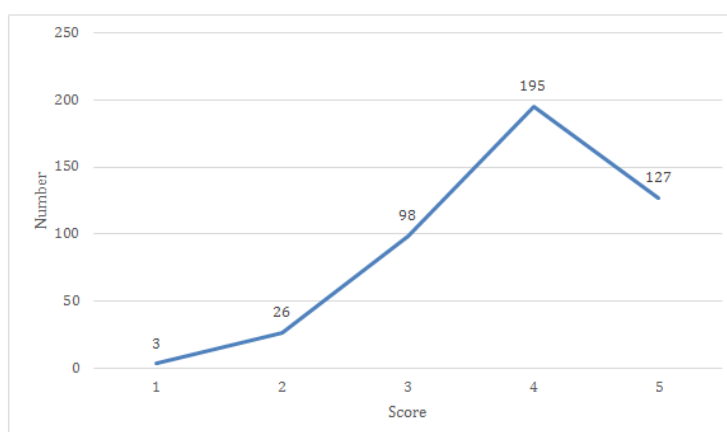
**Table-1: Distribution of HCW dealing with COVID-19 patients and receiving recent IPAC training**

Question	Yes		No	
	N	%	N	%
Work in a place dealing with suspected or confirmed COVID-19 cases AND FIT test performed	207	60.2	137	39.8
Work in a place dealing with suspected or confirmed COVID-19 cases AND had hand hygiene training during the last 5 years	257	74.7	87	25.3
Work in a place dealing with suspected or confirmed COVID-19 cases AND received recent IPAC/PPE training	266	77.3	78	22.7
Get in contact with suspected or confirmed COVID-19 cases AND FIT test performed	110	35.5	200	64.5
Get in contact with suspected or confirmed COVID-19 cases AND had hand hygiene training during the last 5 years	240	77.4	70	22.6
Get in contact with suspected or confirmed COVID-19 cases AND received recent IPAC/PPE training	255	82.3	55	17.7

**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 about the questions related to usual hand hygiene, initial measures to deal with suspected/ confirmed COVID-19 cases,

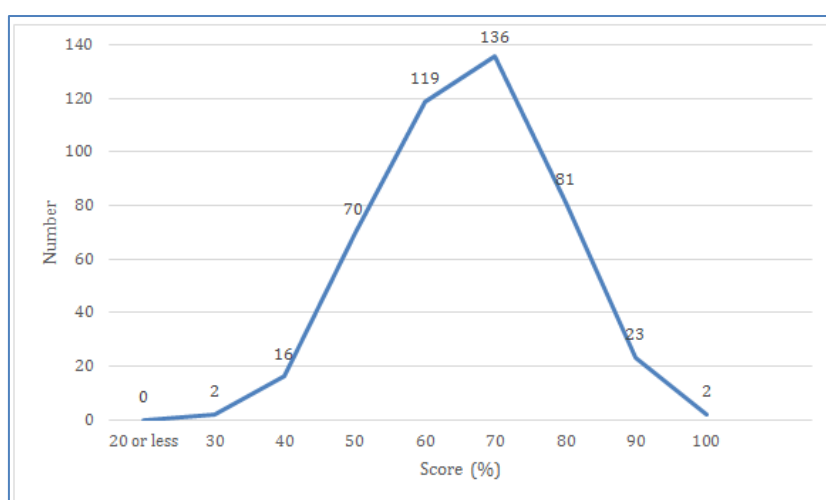
PPE, and performing Aerosol Generating Procedure (AGP). On the other hand, inadequate numbers of correct responses appeared in questions related to following items; hand hygiene of visibly soiled hands, donning and doffing of PPE, and others as shown in Table 2.

**Table-2: Survey questions and number of accurate/inaccurate responses**

Survey Question	Accurate responses		Inaccurate responses	
	N	%	N	%
Gloves used for dealing with suspected or confirmed COVID-19 case should be always sterile gloves?	301	67	148	33
When should you perform the hand hygiene?	418	93.1	31	6.9
If your hands get VISIBLY soiled, what is the best way to clean them?	200	44.5	249	55.5
If a healthcare professional is involved in care of a suspected or confirmed COVID-19 case, what PPE should he wear?	449	100	0	0
If a healthcare professional is involved in care of ASYMPTOMATIC CONTACT of confirmed COVID-19 case, what PPE should he wear?	414	92.2	35	7.8
Which of the following is recommended for isolation of confirmed, or suspected COVID-19 cases under investigation?	131	29.2	318	70.8
Which of the following is a recommended infection control measures upon arrival of a suspected COVID-19 case?	401	89.3	48	10.7
A recommended infection control and prevention measure is to perform Aerosol Generating Procedure (AGP), including collection of respiratory specimens, in airborne infection isolation room?	335	74.6	114	25.4
What is the proper sequence of PPE donning?	152	33.9	297	66.1
What is the proper sequence of PPE doffing is?	160	35.6	289	64.4

We set a total score of 70% as a passing score of our survey. We found that 53% of HCW (n= 242) were able to achieve similar or higher scores, while

47% of HCW (n=207) did not achieve it as shown in fig. 6.



**Fig-6: Distribution of scores achieved by HCW participating in the survey <sup>a</sup>.**  
<sup>a</sup> expressed as percentage of total mark

Analysis of data related to pass or fail rates of the questionnaire in relation to demographic and occupational characteristics revealed that there was a significant difference of pass rate in relation to age ( $p < 0.001$ ) being lower in the age group below 30 years. We

also found a significant difference of pass rate in relation to gender and job ( $p < 0.05$ ). However, there was no significant difference in relation to the duration of experience ( $p > 0.05$ ) as shown in table 3.

**Table-3: Distribution of pass/ fail rates in relation to demographic and occupational characteristics of HCW participating in the survey**

PARAMETER	PASS		FAIL		P
	N	%	N	N	
AGE (YEAR)					<0.001
BELOW 30	4	16	21	84	
30-39	142	59.7	96	40.3	
40-49	65	48.9	68	51.1	
50 AND ABOVE	31	58.5	22	41.5	
SEX					0.045
MALE	158	57.7	116	42.3	
FEMALE	84	48	91	52	
JOB					0.007 (FISHER EXACT)
MEDICAL HCW	238	55.2	193	44.8	
NON-MEDICAL HCW	4	22.2	14	77.8	
EXPERIENCE (YEARS)					0.457
LESS THAN 5	29	50	29	50	
5-9	42	62.7	25	37.3	
10-14	67	52.8	60	47.2	
15 AND ABOVE	104	52.8	93	47.2	

## DISCUSSIONS

In our work, we assessed the HCW's knowledge in various infection control information based on the Interim Infection Prevention and Control Recommendations for patients with suspected or confirmed coronavirus disease 2019 (COVID-19) in healthcare settings that has been provided by CDC [15].

Around 70% of total participants in this study get in contact with suspected or confirmed COVID-19 cases or provide service for them. We found that 73% of participants received formal hand hygiene training by their institutes while 72% of them received formal PPE training and almost half of them performed the N95 fit test recently. On the other side, 23.4% of participants do not work in health care facilities dealing with COVID-19 patients. Around 40% of HCW did not perform N95 respirator fit testing while around one quarter did not receive recent PPE or hand hygiene training. 69% of HCW provided direct service to COVID-19 patients and 64% of them did not perform N95 respirator fit testing while around 20% of them did not receive PPE or hand hygiene training. Hand hygiene has been considered the most critical measure for reducing the cross-infection transmitting risk to the patients [16-18]. Our cross-sectional study showed lower knowledge and pass rates in relation to younger age groups especially below 30 years ( $p < 0.001$ ) and a significant difference in knowledge and pass rates in relation to gender and job being lower among non-medical female HCW ( $p < 0.05$ ). This goes with what was concluded in a cross-

sectional study at Najran in Saudi Arabia regarding knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) that physicians and nurses had significantly better knowledge compared with other healthcare workers [19]. Our results showed that 53% of HCW have adequate knowledge about IPAC measures while 47% 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 [20]. 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 HCW for SARS-CoV-2 prevention which showed that the adequate knowledge about PPE was available in only 25.7% of the HCW responders from different branches including medical doctors, nurses and clinical students [21].

## 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, female and non-medical HCW. Even though the non-medical group is not actively involved in patient management, yet there is high possibility that they get in contact with patients at some point in the healthcare process and therefore at risk of contracting and spreading the infection.

## RECOMMENDATION

Conducting periodic educational activity intervention for all healthcare professionals including clinical, non-clinical and administrative staff could be a helpful and safe tool to create proper awareness of infection control. This periodic activity should be targeted towards certain HCW groups, namely young, female, and non-medical HCW 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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