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Research Article

Study of Knowledge, Attitude, and Practice Regarding COVID-19 to Improve Safety Practice among Health Care Workers

Safaa ELMeneza* and Amel Gaber

Pediatrics Department, Faculty of Medicine for Girls, AL-Azhar University, Egypt

***Corresponding Author:** Safaa ELMeneza, Pediatrics Department, Faculty of Medicine for Girls, AL-Azhar University, Egypt.

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Abstract

Background: Healthcare workers are more vulnerable to COVID-19 infection both physically and psychologically.

Aim: The aim of this study was to estimate the gap in the knowledge, attitude and practice of the HCWs regarding COVID-19 in order to improve safety care and promote focus training to protect HCWs from adverse events /infection.

Methods: A cross sectional survey was applied from May 2020 to July 2020 involving 127 health care workers from Al-Zhraa University hospital.

Results: The highest response rate to survey was from nurses (51.97%), 37% of the respondents had 3-9 years of experience. Educational status varied from diploma of nursing in 44.1% to MD in 11.8%. There was association of knowledge with education, years of experience, female gender, work in frontline, and non-overworked. P values were < 0.00001, 0.0017, 0.019, < 0.00001 respectively. Fear was recorded among 81.10% and 55.9% had confidence in defeating COVID-19 virus. Practice were assessed through seven items. Maintained quarantine with family was reported among 74.8%, 29.92% did not receive training for COVID-19 infection prevention. 52.76% did not follow protocols to deal with PPE, 97.63 wear mask when contact with patient, 81.1% was refrained from shaking hands and 55.9% avoid patients with signs and symptoms suggestive of COVID-19.

Conclusion: HCWs of AL-Zhraa University hospital had significant knowledge, attitude and positive practice to COVID-19. However, residents need focused on job training regarding mode of infection of COVID-19, use of PPE and apply suitable PPE for the provided care.

Keywords: KAP Study; Patient Safety; COVID-19; Health Care Workers

Introduction

Healthcare workers (HCWs)are more vulnerable to COVID-19 infection both physically and psychologically than the general population. The World Health Organization (WHO) reported that one in ten HCWs is infected with coronavirus in some countries [1].

The international council of nurses reported in May 2020 that at least 90,000 HCWs have been infected and more than 260 nurses had died in the COVID-19 pandemic [2]. More than 1323 HCWs had already died from 64 countries as of June 2019, the youngest is 20, the eldest is 99 [3].

The first report by Egyptian medical syndicate showed death of 12 doctors from COVID-19 in May 2020. Recently the number increased to 130 doctors [4].

The dispute concerning the method of transmission and COVID-19 traits may influence the protocol of infection control. HCWs, are in danger due to exposure of eye and mucus membranes dur-

ing suction, intubation, improper personal protective equipment (PPE), overcrowding and sub-optimal control of visitors.

Protecting patients, visitors and HCWs is one trait of safety culture [5,6]. Confirming that HCWs are properly trained regarding COVID-19 protection measures as standard, contact, and droplet infection prevention and control precautions, incorporating the use of appropriate PPE, is a necessity.

Aim of the Study

The aim of this study was to estimate the gap in the knowledge, attitude and practice of the HCWs in Al-Zhrraa University hospital regarding COVID-19 in order to improve safety care and promote for focus training to protect HCWs from adverse events/infection.

Methods

A cross sectional survey was applied from May 2020 to July 2020 involving 127 HCWs from Al-Zhraa University hospital, Cairo, Egypt.

Study population

HCWs (nurses, residents, assistant lectures and staff) who responded to the questioners were included in the study.

Study procedure

Data was collected from HCWs using a self-administered questionnaire designed to assess knowledge, attitude and practice concerning COVID-19. Distribution through personal, WhatsApp and Monkeys survey was done. We guaranteed confidentiality regarding the personal response. The survey was designed to include questionnaire related to the demographic data, Knowledge, attitude and practice to COVOID-19.

The demographic data included gender, profession/job category, years of experience, educational status, overwork and worked in frontline. Frontline was defined as a worker directly involved in COVID-19 prevention and treatment and had direct contact with confirmed or suspected cases. Overworked status was defined as work more than 8 hours per day [7].

The Knowledge questionnaire included 23 items to assess HCWs' knowledge regarding the COVID-19 infection, PPE and dealing with waste. Responses were recorded as yes if she/he knows or no if don't know.

The questioners were adapted from Zhong., *et al*. [7] and Zhang., *et al*. [8] then modified to our situation, each correct answer weighing one point.

The attitudes questionnaire included four items regarding the HCWs' fear of the epidemic, confidence in defeating the virus, feelings of fatigue and attitude regarding if patients/visitors with risk factors for COVID- 19 should disclose their exposure. The response was either agree or disagree.

Practices questionnaire included seven items regarding the quarantine with family, participation in training before and after the outbreak on infection control and prevention, follow protocol to carefully deal with/remove protective equipment, and if apply the WHO 5 moments. Also, if wear a mask when contact with patients, refrain from shaking hands and if avoid patients with signs and symptoms suggestive of COVID-19.

Practices were assessed using yes if she/he practices or no if don't practice.

Study variables

Independent variables include demographic details which include gender, profession category, years of experience, educational status, worked in frontline and if overworked.

Dependent variables include knowledge, attitude and practices toward COVID-19.

Data management and analyses

Data were verified, validated and coded into variables. Data represented as frequencies and percentage using the Microsoft excel office 2010 and Social Sciences software, version 16.0 (SPSS Inc., Chicago, IL). $P < 0.05$ considered to indicate statistical significance.

Results

The total number of the respondents were 127. Details of respondent's characteristics are presented in table 1.

Knowledge

The total know answers were 1896 answers, details accessible in table 2. There was association between knowledge and profession (staff), education (MD), years of experience (3 - 9), previous work in front line, and non-overworked HCWs. P values were < 0.00001, < 0.00001, < 0.00001, 0.0017, 0.019, < 0.00001 respectively (Supplement 1).

Demographic data		Number	Percentage
Gender	Female	124	97.63
	Male	3	2.37
Profession/Job Category	Nurse	66	51.97
	Residence	29	22.83
	Assistant lectures	16	12.6
	Staff	15	11.81
	Pharmacist	1	0.79
Years of experience	< 3	40	31.5
	3 - 9	47	37
	> 10	40	31.5
Educational status	Nurse diploma	56	44.1
	Bachelor	40	31.5
	Master	16	12.6
	MD	15	11.8
Worked in front-line	Yes	49	38.6
	No	78	61.4
Overwork	Yes	32	25.2
	No	95	74.8

Table 1: Characteristics of the respondents.

Questions	Know N (%)	Don't Know N (%)
1-How to isolate the COVID-19 patient?	107 (84.25)	20 (15.75)
2-How to isolate the COVID-19 patient if no available separate rooms?	71 (55.9)	56 (44.1)
3- How to identify people at risk of COVID-19/what are main clinical symptoms of COVID-19?	107 (84.25)	20 (15.75)
4- Do you know the incubation period for COVID-19?	23 (18.11)	104 (81.89)
5-Do you know most common methods for transmission of COVID-19 infection?	72 (56.69)	55 (43.31)
6-Do you know the protocols you have to follow for dealing with COVID-19 patient?	29 (22.83)	98 (77.17)
7-Do you know where to go for guidance on COVID-19?	107 (84.25)	20 (15.75)
8-Do you know what PPE to use when dealing with COVID-19 cases?	124 (97.63)	3 (2.37)
9-Do you know what mask to use when dealing with COVID -19 cases?	98 (77.16)	29 (22.84)
10-Do you know when to use the surgical mask?	111 (87.4)	16 (12.6)
11-Do you know what mask to use when doing aerosol generating procedures as suction/ET intubation/use MV etc.?	80 (62.99)	47 (37.1)
12-Do you know if N95 mask has different sizes?	10 (7.87)	117 (92.13)
13-Do you know what PPE to use when doing aerosol generating procedures suction/ET intubation/use MV, resuscitation/delivery?	51 (40.16)	76 (59.84)
14-Do you know how to take face mask off?	73 (57.48)	54 (42.52)
15-Do you know how many time to use the surgical mask?	125 (98.43)	2 (1.57)
16-Do you know where the surgical mask is disposed of?	91 (71.65)	36 (28.35)
17-Do you know you need to wash hands after disposing the mask?	125 (98.43)	2 (1.57)
18-Do you how to put on PPE?	70 (55.12)	57 (44.88)
19-Do you know how to take off PPE?	71 (55.9)	56 (44.1)
20-Do you know how to get rid of corona patient wastes after caring for him/her?	59 (46.46)	68 (53.54)
21-Do you know what PPE to wear when get off the waste of COVOD-19 patient?	57 (44.88)	70 (55.12)
22-Do you know that you need to wash hands after get off waste of COVOD-19 cases?	125 (98.43)	2 (1.57)
23-Do you know what disinfectant to use to clean surfaces and devices?	104 (81.89)	23 (18.11)
Mean ± SD	82.2 ± 33.72	44.83 ± 2.12
	T -12.5	P < 0.0001

Table 2: Knowledge of the respondents regarding COVID-19.

PPE: Personal Protective Equipment; ET: Endotracheal Intubation; MV: Mechanical Ventilation.

Attitude

Table 3 shows details of studied 4 items. There was association between fear of COVID-19 and profession, gender and overwork. Residents and female were the most significant category. There was association of confidence of defeating the virus in relation to

years of experience >10 years and non-overworked health care workers (Supplement 2).

Practice

Details are shown in table 3 and supplement 3. Nurses were significantly practice quarantine than other profession as well as HCWs > 10 years of experience, previous work in frontline and non-overwork, P values were 0.0006, 0.00096, 0.00007, .0013 and 0.0094.

Questions	Yes N (%)	No N (%)
Attitude		
Fear of COVID-19	103 (81.1)	24 (18.9)
Confidence in defeating the virus	71 (55.9)	56 (44.1)
Feelings of fatigue after the outbreak	73 (57.48)	54 (42.52)
Patient/Visitors with risk factors for COVID-19 should disclose their exposure	83 (85.35)	44 (34.65)
Mean ± SD	82.5 ± 14.14	44.5 ± 14.14
T student test	T 204.258	P < 0.0001
Practice		
Questions	**Yes N (%)**	**No N (%)**
1-Do you maintain quarantine with family?	95 (74.8)	32 (25.2)
2-Did you participate in training before and after the outbreak on infection control and prevention?	38 (29.92)	89 (70.08)
3-Do you follow protocol to deal with/ remove protective equipment carefully	67 (52.76)	60 (47.24)
4-Do you practice the WHO 5 moments?	56 (44.1)	71 (55.9)
5-Do you wear a mask when in contact with patients?	124 (97.63)	3 (2.37)
6-Do you refrain from shaking hands?	103 (81.1)	24 (18.9)
7-Do you avoid patients with signs and symptoms suggestive of COVID-19?	71 (55.9)	56 (44.1)
Mean ± SD	79.14 ± 22.6	47.9 ± 22.63
T student test	T test -11.015	P 0 < 0.0001

Table 3: Attitude and practice of the respondents.

Training was associated significantly with < 3 years of experience and frontline staff as well as non-overwork staff, P values were 0.003, < .00001 and 0.0033.

There was association between follow protocols to deal with/ remove protective equipment with level of experience >10 years, non-overworked staff; P values were 0.0192 and 0.046 respectively.

Nurses were practicing 5 moments more than other professions as well as those who worked in frontline. Residents were the least to practice 5 moments, as well as those with level of experience < 3 years and overwork. P values were 0.015, 0.012, 0 < .00001 and 0.0012.

There was significant association between the wear mask when contact with patients and the profession status (nurses and residents) as well as female gender. P values were 0.0119 and 0.00035.

Nurses and residents were more than others to refrain shaking hands. Refrain shaking hands was associated also with education, Level of experience > 10 years, female gender, previous work in front line and non-overwork health care workers too. P values were < 0.00001, < 0.00001, < 0.00001, 0.0325, 0.0143 and 0.039.

There was association between avoid patients with signs and symptoms suggestive of COVID-19 and profession; residents were the least to avoid the patient than other categories, while nurses were the higher to avoid patients. P value was 0.0041.

Details are shown in supplement 3.

Discussion

The results of assessment of knowledge, attitudes and practices among the HCWs and the factors that may influence their responses, may present recommendations to avoid additional infection or death among HCWs and promote safe care for patient.

Majority of the respondents were female (97.63%), it is due to the predominance of female HCWs in Faculty of Medicine for girls. The highest response rate to the survey was from nurses (51.97%) followed by residence (22.83%) then assistant lecturers (12.6%). Thirty-seven percent of the respondents had 3-9 years of work experience. Educational status varied from nursing diploma in 44.1% to MD in 11.8% of the respondents. Only 38.6% had worked in the frontline and 25.2% worked more than 8 hours /day. These findings are more or less concomitant with others [7,8], but not concurrent with study of Olum., *et al*. they reported more male gender in their study, also the majority of respondents had Bachelor degree [9].

This study revealed that some knowledge was well known by the respondents as how many time to use surgical mask (98.43%), what PPE to use when dealing with COVID-19 cases (97.63%), how to isolate COVID-19 patient and the criteria for identifying people at risk of COVID-19 (84. 25%). On the contrary there was deficiency

in some knowledge as incubation period for COVID-19 (18.11%), knowing protocols to deal with COVID-19 patient (22.83%), know if N95 mask has different sizes (7. 87%). These findings may direct the future training of HCWs to strengthen their information and subsequently modify their attitude and practice regarding COVID-19. The level of knowledge regarding the COVID-19 was higher among doctor's staff than others. There was association of level of knowledge with the education, years of experience, female gender, previous work in front line, and working regular hours. P values were < 0.00001, 0.0017, 0.019, < 0. 00001 respectively. These findings are contemporaneous with those reported by others [7,8].

These results were not parallel to Olum., *et al*. [9] as they reported that HCWs had similar knowledge irrespective of age, sex, academic qualification or profession.

The current study reveals that HCWs need to acquire adequate knowledge regarding COVID-19 clinical symptoms and signs, incubation period, management and prevention as well as PPE in order to protect themselves and others. Imperfect knowledge regarding the PPE may be the cause for higher deaths among doctors. Sufficient knowledge is one of the vital elements for safety and quality of care to patient, staff and visitors and to avoid adverse events during COVOID-19 epidemic. A previous study reported that in the initial outbreak of the virus, two thirds of the infected medical staff worked in general wards, 17.5% in the emergency department, and 5% in the ICU. An important reason for early infection among general ward medical staff was that patients were admitted to the ward without protective measures in place [10].

The attitude of the respondents was mainly related to years of experience, profession and overwork. Educational status did not significantly affect the attitude in majority of the studied items, there was no association with fear, confidence to defeat the virus and if patient/visitors with risk factors for COVID-19 should disclose their exposure.

There was 81.1% of the staff had fear from the infection, nevertheless 55.9% had confidence in defeating the COVID -19 virus. There was association between fear of COVID-19 and profession, gender and overwork. Residents and nurses were the highest to be scared as well as female gender. Fear was not related to education or year of experience or work in frontline before. Fear is natural feeling, it could be due to incomplete understanding of COVID-19 virus, inadequate training or availability of PPE and direct contact with suspected cases or patients weather in word or in ICU. They were involved with aerosol-generating procedures and diagnostic testing that increase the possibility of viral transmission.

There was association of confidence of defeating COVID-19 virus in relation to years of experience >10 years and among non-overworked HCWs. HCWs with more years of experience may see other epidemics and gain more confidence and skills.

Fatigue was reported by 57.48% of the respondents. Nurse's profession was the most profession to feel fatigue and the least was the staff. These findings were related to the nature of physical work and working hours.

There was 85.35% of HCWs agreed that patient/visitors with risk factors for COVID-19 should disclose their exposure to COVID -19, this was significantly associated to profession; P value was 0.002, years of experience > 10 years; P was 0.002, and non-overworked HCWs; P was < 0. 00004. There was no association to educational status or gender. Nevertheless, Zhang et al reported association to the level of the knowledge of the HCWs [8].

In this study practice was assessed through seven items that emphasis on different aspects of applying infection control measures, that may affect spread of COVID-19.

There were 74.8% of the HCWs maintained quarantine with their family. This practice was associated significantly with nurse profession and those HCWs who have > 10 years of experience. Also, it is related to previous work in frontline and overworked variables, P values were < 0.0006, < 0.0001, < 0.0001, 0.0013 and 0.009 respectively. These findings were interrelated to results of Zhang., *et al*. they reported that non-frontline HCWs were less likely to maintain quarantine with family [8]. The other 25.2% who don't apply quarantine, may violate safety measures and carry risk of infection to their family.

Nearly one third of the respondents did not receive training for prevention of COVID-19 infection. Participation in training was more significantly reported by HCWs < 3 years of experience, staff worked in frontline as well as non-overwork staff. This is an important finding as although the less expert staff and those who worked in frontline had more training related to COVID-19 infection, nevertheless one third of the staff did not have training related to COVOID-19. Wang., *et al*. reported inadequate training as one of the four factors that cause infection among HCWs [11]. Inadequate

training may affect the safety of the HCWs and could be among the causes of high mortality among HCWs.

Inadequate training influence the use of the PPE whether don or doff and considered as one of the important aspect in protecting the HCWs from infection and prevent contamination [12]. 52.76% of the respondents did not follow protocols to deal with remove PPE especially among those who did not receive training. Following protocols was positively associated with experience >10 years, P was 0.019 and non-overwork staff, P was 0.046. Accordingly training and years of experience were the contributing factors for proper use of PPE. Education and training on proper use of PPE should target beginners and juniors HCWs with less experience achievement.

All the HCWs practiced hand wash after care of patients, but only 44.1% of HCWs follow the 5 moments. There was significant association between the practice of 5 moments and profession, level of experience, work in front line and non -overwork. There was no association to the level of education or gender.

Nurses and HCWs worked in frontline practiced 5 moments more than other HCWs, P values were 0.015 P and 0 < .00001 respectively. The nature of work of nurses include hazardous procedures that make them exposed to infection and affect their safety.

The least HCWs to practice 5 moments was residents, those with level of experience < 3 years; P value was 0.012 and overworked staff; P value was 0.0012. It had been reported before that overworked HCWs washed their hands fewer times [8], overworked staff may have no time to practice 5 moments, therefore, health care system need to maintain appropriate working hours even during epidemics to ensure safety of the HCWs.

The other positive practice included wear mask when in contact with patients and refrained from shaking hands. Wear mask was reported by 97.63% of the respondents HCWs, this was significantly associated with nurse profession. 81.1% of the HCWs refrained from shaking hands that was associated with profession, education; > 10 years of work experience, female gender**,** previous work in frontline and non-overwork HCWs.

Unexpectedly 55.9% of the respondents avoid patients with signs and symptoms suggestive of COVID-19. These practice may arise from fear and confusion regarding other unconfirmed mode of infection. Nurses were the highest to avoid these cases while residents were the least. There was no association with the educational status, level of experience, gender, work in frontline or overworked. These findings are similar to those of Olum., *et al*. as 60% of the participants had avoided patients with symptoms similar to those of COVID-19 [9].

The current study showed weak association of knowledge to the attitude and practice. Consequently, insufficient knowledge is not the merely risk elements to endanger care and HCWs safety. Other factors as protective strategy in the health care system, predominance of safety culture, work experience and duration of work [13] are included.

The study revealed that residents are at high risk for infection; only 13.8% of them received training for COVID-19, this could affect their knowledge, attitude and practice regarding COVID-19. Residents were the least profession to avoid patient with signs suggestive COVID-19, that augment the probability of infection if they were not receive proper training.

There are several limitations for the current study; the small number of the respondents, the study represented one hospital and finally we formulated the questions from different sources and translated to Arabic language to facilitate its use. There was no available standardized tool for assessing KAPs on COVID-19.

Conclusion

In conclusion, the study showed that HCWs of AL-Zhraa University hospital had significant knowledge, attitude and positive practice to COVID-19. However, residents need focused on job training regarding mode of infection of COVID-19, use of PPE and use of suitable PPE for the provided care. Also training aspects have to be related to educational state, work experience and nature of patient care in order to increase safety of health care workers and minimize adverse events due to hospital acquired infection by COVID-19. Health care system need to provide strategy to avoid overwork, provide PPE, implement preventive policy and procedures, advocate for training of the HCWs especially residents and nurses, nominate time for busy HCWs to be able to attend workshops. These may decrease the future infection and death among the HCWs.

Conflict of Interest Statement

None declared.

Funding Source

No funding resources.

Profession	Nurse	Residents	Assistant Lecture	Staff	Chi-square	P
Know	1000	300	200	245	92.3	< 0.00001
Don't Know	518	367	168	100		
Educational status	Nurse	Bachelor	Master	MD		
Know	888	500	208	300	614.24	< 0.00001
Don't Know	400	420	160	45		
Years of experience	<3	3-10	>10			
Know	300	890	700		614.24	< 0.00001
Don't Know	620	191	220			
Gender	Female	Male				
Know	2450	50			9.87	0.0017
Don't Know	402	19				
Worked in frontline	**yes**	**No**				
Know	980	1130			11.82	0.019
Don't Know	147	664				
Overwork	**Yes**	**No**				
Know	500	1890			127.56	< .00001
Don't Know	236	295				

Supplement 1: Association of knowledge to the studied variables.

Questions	Profession		Educational status		Year of experience		Gender		Worked in front line		Over work	
	Chi	P	Chi	P	Chi	P	Chi	P	Chi	P	Chi	P
1-Fear of COVID-19	11.82	.0198	2.23	0.53	0.62	0.74	4.56	0.033	0.12	0.73	4.39	0.04
2-Confidence in defeating the virus	0.52	0.97	1.57	0.87	47.14	< 0.00001	0.14	0.70	0.35	0. 56	5.88	0.015
3-Feelings of fatigue after the outbreak	42.24	0.00001	63.72	< 0.00001	7.58	0.023	0.73	0.392	0.19	0.67	0.44	0.51
4-Patient/Visitors with risk factors for COVID-19 should disclose their exposure.	16.7	0.002	5.78	0.123	12.67	0.002	1.39	0 .24	0.57	0.45	16.74	.00004

Supplement 2: The association of the attitude to the studied variables.

Questions	Profession		Educational status		Year of experience		Gender		Worked in front line		Over work	
	Chi	P	Chi	P	Chi	P	Chi	P	Chi	P	Chi	P
Do you maintain quarantine with family?	19.45	0.0006	16.39	0.00096	19.12	0 .00007	0.18	0 .743	10.33	.0013	6.74	.0094
Did you participate in training before and after the outbreak on infection control and prevention?	9.035	0.0604	1.16	0.763	11.93	0.003	1.98	0.159	79.1	< .00001	8.613	0.0033
Do you follow protocol to deal with/ remove protective equipment carefully?	6.313	0.177	4.53	0.21	7.902	0.0192	0.47	0.4953	1.323	0.25014	3.995	0.046
Do you practice the WHO 5 moments?	12.403	0.015	2.43	0.583	8.88	0.012	0.144	0.70401	36.23	0 < .00001	10.55	0.0012
Do you wear a mask when in contact with patients?	12.88	0.012	1.51	0.7013	0.02	0.99	12.89	0.00035	0.036	0.901	0.108	0.743
Do you refrain from shaking hands?	37.943	< 0.00001	42.521	< 0.00001	26.1313	< 0.00001	4.65	0.0325	5.998	0.0143	4.26	0.039
Do you avoid patients with signs and symptoms suggestive of COVID-19?	15.321	0.0041	4.462	0 .22	3.09	0.223	0.64	0.431	0.35	0.654	2.86	0.09

Supplement 3: The association of the practice to the studied variables.

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