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RESEARCH ARTICLE

Jordanian Nurses' Knowledge, Attitudes, and Willingness to Provide Care to Patients with COVID-19

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Abstract:

Background:

previous studies showed that nurses reported inadequate knowledge of the risks and protective strategies in dealing with infectious diseases. Additionally, nurses reported a lack of willingness to care for patients with infectious diseases.

Purpose:

To examine Jordanian nurses' knowledge and attitudes and their willingness to provide care for patients with COVID-19.

Design and Methods:

Correlational cross-sectional design with convenience sampling was used to collect data through an online self-administered questionnaire from 347 Jordanian nurses working at hospitals.

Results:

The study results showed that about 56% of the nurses reported having the experience of treating or providing care to confirmed or suspected COVID-19 patients, and 71.8% expressed their willingness to provide care for them. Only 55% of the nurses reported finishing a training program about COVID-19. Job title, type of hospital, and experience in treating or caring for patients with COVID-19 were predictors of nurses' willingness to provide care.

Conclusion:

Jordanian nurses reported gaps in their knowledge about COVID-19 related to using personal protective equipment and fear of transmitting the disease to family members. Nurses also reported a moderate level of attitude toward hand hygiene and the use of personal protective equipment; however, most of the nurses reported willingness to provide care for COVID-19 patients.

Keywords: Attitudes, COVID-19, Knowledge, Nurses, Patient care, Infectious diseases.

1. BACKGROUND

COVID-19 is a novel infectious disease caused by coronavirus. This virus was firstly identified in Wuhan- China, in December 2019 [1]. On February 11, the WHO announced COVID-19 as the new name for Corona Virus. COVID-19 is short for "Coronavirus Disease 2019" [2], now known as SARS-CoV-2 [3]. Coronaviruses are a common cause of upper respiratory tract infections [4]. The virus led to a public health international concern, putting all health organizations on high alert [4]. At the time of writing this paper, the confirmed global cases infected with this virus were 12,685,374 and 565,000 deaths [1].

Many aspects of the disease are still unknown, with recently published information about the virus. Although the precise mechanism of its spread is not yet entirely clear, the SARS-CoV-2 virus spreads through close contact from person to person and from direct contact with infected surfaces or

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objects [3]. Recent WHO updates declared that possible transmission methods might include droplet, airborne, fomite, fecal-oral, bloodborne, mother-to-child, and animal-to-human transmission [5]. Close contact has been defined by the Centers for Disease Control and Prevention (CDC) as being within about six feet of someone for a prolonged period without wearing recommended Personal Protective Equipment (PPE) [3]. The signs and symptoms of COVID-19 range from mild to severe illness. Some cases of asymptomatic transmission of SARS-CoV-2 [6]. The best way to prevent and slow down transmission is to be well informed about the COVID-19 virus and how it spreads.

The WHO [7] published COVID-19 guidance on the rights and responsibilities of health workers concerning occupational safety and health. Healthcare professionals (HCPs) must follow established occupational safety and health procedures, avoid exposing others to health and safety risks and participate in employer-provided occupational safety and health training. HCPs, nurses, in particular, are the frontline staff to respond to this pandemic [7]. They are at high risk of pathogen exposure, long working hours, psychological distress, fatigue, occupational burnout, stigma, and physical violence [7]. Nurses usually spend prolonged time with patients compared to other health care professionals. Their challenging role in pandemic crises mandates their preparedness in many aspects [8]. Nurses' knowledge and attitudes affect their preparedness to deal with infected patients and affect their practices during stressful situations. Preparedness can be classified as self-preparedness and institutional preparedness [9]. Self-preparedness depends on knowledge about the virus, a safe approach to patients, and adherence to safety measures. Institutional preparedness is reflected by making HCP safety measures available for HCPs and providing clear protocols to deal with COVID-19 patients [9]. The rapid spread of COVID-19 did not prepare the health sector for the battle. Many efforts from health organizations and local institutions aim to improve healthcare workers' knowledge of dealing with the virus. This knowledge helps HCPs contain and stop the spread of the virus [10].

The growing number of COVID-19 cases resulted in an urgent need to assess the nurses' preparedness and willingness to deal with infected patients. Moreover, on average, 6% of all confirmed cases of COVID-19 are among HCPs [11]. Previous evidence [12, 13] and current evidence [14 - 18] on the knowledge and attitudes of HCPs toward influenza pandemic suggested that HCPs had a fear of self-infection with the virus, anxiety, inadequate knowledge of the risks of and protective strategies for an influenza pandemic, and lack of willingness to work during the pandemic. Identifying nurses' knowledge and attitudes and the factors that affect their attitudes and behaviors can inform relevant training and policies during the outbreak [17].

To the best of our knowledge, no research has been conducted to assess Jordanian nurses' knowledge and attitudes toward COVID-19. Suleiman, Bsisu [9] conducted a survey to evaluate Jordanian doctors' preparedness to deal with the virus. They found that doctors with higher knowledge were more concerned about dealing with COVID-19 patients and more

anxious regarding the increased numbers of COVID-19 patients. Another study by revealed good knowledge, practice, and a positive attitude among medical students toward COVID-19 [19]. Therefore, this study aimed to assess nurses' knowledge and attitudes regarding COVID-19 in Jordanian hospitals and assess their willingness to provide care for patients with COVID-19. Findings from this study will add to the recent growing literature on nurses' knowledge of COVID-19 and inform policy makers and nurse leaders to identify interventions that focus on nurses' knowledge and attitudes for current and future pandemics.

2. MATERIALS AND METHODS

2.1. Design

A correlational cross-sectional design was utilized in this study.

2.2. Settings

The study was conducted using online surveys distributed to nurses working in Jordanian hospitals. Jordan has four types of hospitals; private hospitals represent 57% of total health services, governmental 28%, military hospitals 13%, and university-affiliated hospitals 2% [20]. The study targeted nurses working in all health sectors in Jordan.

2.3. Sample and Sampling

Convenience sampling was used to include 347 nurses from different hospitals in Jordan. Nurses working in hospitals, able to read and write English, and willing to participate were included in the study. The sample size was calculated with the G power program. The F test was utilized using an Alpha level of 0.05, a medium effect size of 0.20, and a power of 0.8. The estimated required sample size was at least 280 nurses.

2.4. Data Collection

Data collection started after obtaining ethical approval. Data were collected using an electronic self-administered questionnaire using Google forms that included a description of the study purpose, data collection procedure, and rights of the participants, followed by the consent statement. Networking and snowballing techniques of sampling were used to reach the target population. All submitted questionnaires were automatically saved in the researcher's private Google drive. Data collection occurred between May 1, 2020, and June 1, 2020.

2.5. Instrument

The questionnaire used in this study was developed by Shi, Wang [16]. The 33-item survey questionnaire was designed to assess the knowledge and attitudes of medical staff (including nurses) in Chinese psychiatric hospitals regarding COVID-19 based on the study of Daugherty, Perl [12]. The questionnaire assessed three main variables: knowledge, attitudes, and willingness.

The participants were asked to report their experience caring for COVID-19 patients and any relevant training they had received (two items). They were also required to report the

level of knowledge (10 items) and attitude (four items) in their ability to protect themselves and their patients from exposure to COVID-19 at work on a 5-point Likert-scale for some of the items (completely agree, agree, neither agree nor disagree, disagree and completely disagree). Two items were used to report participants' willingness to treat or care for patients with COVID-19. Finally, the participants were asked to report their behaviors and management practices (eight items) in caring for patients infected with the COVID-19 virus. Seven items were used to assess nurses' demographic characteristics, including hospital type, age, educational level, gender, marital status, job title, and living status. Only one question was modified from the original survey, "Have you had the experience treating or caring for psychiatric patients with confirmed or suspected COVID-19?" in which "psychiatric" was omitted. The questionnaire was distributed in the English language. Two experts in the field assessed content validity to ensure its appropriateness to the Jordanian culture and the study purpose. The Cronbach alpha reliability of the instrument in the current study was 0.76.

2.6. Ethical considerations

Ethical approval was obtained from the Scientific and Research Committee at Al-Ahlyyia Amman University-Faculty of Nursing (9-2019/2020). The data collection took place through an electronic self-administered questionnaire, the institutions obtained no permissions. Participation was voluntary, and nurses were assured that their responses would be confidential. The anonymity of the participants was ensured throughout the study. Data were secured in a password-protected computer. Permission was obtained from the author to use and adapt the questionnaire used in this study.

2.7. Data analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) version 23 [21]. Descriptive statistics (*i.e.*, mean, percentage, and standard deviation) were calculated to describe demographic characteristics and nurses' knowledge and attitudes regarding COVID-19. All Likert-scale responses were dichotomized into completely agree/agree, neither agree nor disagree, and disagree/completely disagree and expressed in proportions. Binary logistic regression was used to identify predictors of willingness to work with COVID-19-infected patients. All hypotheses were tested as two-sided at a significance level of $P \leq 0.05$ and 95% confidence intervals.

3. RESULTS

The sample consisted of 347 nurses. The mean age was 32.14 (SD= 6.72), ranging from 21 to 56 years. More than half of the sample were females, 198 (57.1%). Most of the nurses had a bachelor's degree 261 (75.2%), were married 213 (61.4%), and worked as registered nurses 193 (55.6%). About 56% of the nurses were from private hospitals, and 25.9% were from governmental hospitals. Nurses reported working in different departments, such as medical-surgical ward 80 (23.1%), intensive care unit 62 (17.9%), and emergency room 51 (14.7%). Other details of the sample characteristics are displayed in (Table **1**).

Table 1. Demographic Characteristics of the Sample N=347.

Variable	Number (%)
Gender	
Male	149 (42.9)
Female	198 (57.1)
Level of education	
Bachelor's degree	261 (75.2)
Master's degree	37 (10.7)
Diploma or associate	42 (12.1)
PhD	7 (20)
Marital status	
Single	121 (34.9)
Married	213 (61.4)
Divorced	10 (2.9)
Widowed	3 (0.9)
Job title	
Registered nurse	193 (55.6)
In-charge nurse	70 (20.2)
Head of a department	33 (9.5)
Administrative	25 (7.2)
Practical nurse	26 (7.5)
Hospital type	
Private	194 (55.9)
Governmental	90 (25.9)
Educational	35 (10.1)
Military	28 (8.1)

(Table 1) contd.....

Department	
Emergency room	51 (14.7)
Intensive care unit	62 (17.9)
Medical-surgical ward	80 (23.1)
Pediatric ward	16 (4.6)
Labor and postpartum wards	32 (9.2)
Clinics	16 (4.6)
Dialysis	4 (1.2)
Administration	24 (6.9)
Others	62 (17.9)
Living status	
Living with parents	121 (34.9)
Living with children	112 (32.3)
Living with a spouse	19 (5.5)
Living alone	21 (6.1)
Living with parents, children, spouse	14 (4.0)
Living with children and spouse	31 (8.9)
Living with parents and children	26 (7.5)
Living with parents and spouse	3 (0.9)

3.1. Knowledge of the risks of COVID-19 and protection strategies, and willingness to provide care for COVID-19 patients

Almost 56% of the nurses reported having the experience of treating or caring for patients with confirmed or suspected COVID-19. Although 55% of the nurses had finished a training program about COVID-19, 71.8% expressed willingness to care for patients suffering from COVID-19. The most common reasons for being unwilling to care for these patients included concerns about transmitting the infection to family members 50 (52.6%), concerns about transmitting the infection to family members and themselves 36 (36.7%), and concerns about transmitting the infection to themselves 12 (12.2%).

Nurses reported receiving information about COVID-19 from various sources, including the internet 62 (17.9%), training programs organized by their hospitals 39 (11.2%), and other sources (including television and medical journals). The largest proportion of nurses, 108 (31.1%), considered surgical masks, N95 masks, gowns, gloves, goggles, face shields, and hand hygiene as the correct PPE to be used. About 31% of the nurses reported that they should wear eye protection and a clean, non-sterile, long-sleeved gown during care for patients with COVID-19 during the following situations: the entire treatment or nursing care, when performing aerosol-generating procedures associated with an increased risk of infection transmission, during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions, and when performing aspirating or open suctioning of the lower respiratory tract, endotracheal intubation, CPR, and bronchoscopy. In addition, 138 (39.8%) of the nurses reported that they should wear a surgical mask or N95 mask during care for patients with COVID-19 during the entire treatment or nursing care if they are working within approximately 1 meter of a patient with COVID-19, and when the patient is on droplet precautions (Table **2**).

Table 2. Jordanian nurses' knowledge and willingness to provide care for patients with COVID-19 during the COVID-19 outbreak (N = 347).

Question	Number (%)
Have you finished the training program about COVID-19?	
Yes	191 (55)
No	156 (45)
Have you had the experience treating or caring for patients with confirmed or suspected COVID-19?	
Yes	193 (55.6)
No	154 (44.4)
The source of your knowledge about COVID-19 include:	
Internet	62 (17.9)
Hospital training program	39 (11.2)
Television and internet	29 (8.4)
Television, internet, medical journals, and hospital training program	28 (8.1)
Television and internet and hospital training program	26 (7.5)
Others	163 (46.9)

(Table 2) contd.....

Correct personal protective equipment includes:	
Surgical mask, N95 mask, gown, gloves, goggles, face shield, hand hygiene	108 (31.1)
N95 mask, gown, gloves, goggles, face shield, hand hygiene	63 (18.2)
N95 mask, gown, gloves, goggles, hand hygiene	18 (5.2)
N95 mask	18 (5.2)
N95 mask, gown, gloves, goggles, face shield	11 (3.2)
Others	129 (37.1)
When should you wear eye protection (*i.e.* goggles or a face shield) and a clean, non-sterile, long-sleeved gown during care for patients with COVID-19?	
During entire treatment and/or nursing care, when performing aerosol-generating procedures associated with an increased risk of infection transmission, during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions, when performing aspirating or open suctioning of the lower respiratory tract, when performing endotracheal intubation, when performing CPR, and when performing bronchoscopy	108 (31.1)
During entire treatment and/or nursing care	49 (14.1)
When performing aerosol-generating procedures associated with an increased risk of infection transmission, during activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions, when performing aspirating or open suctioning of the lower respiratory tract, when performing endotracheal intubation, when performing CPR, when performing bronchoscopy	20 (5.8)
During activities that are likely to generate splashes or sprays of blood, body fluids, secretions, and excretions	19 (5.5)
When performing aerosol-generating procedures associated with an increased risk of infection transmission	18 (5.2)
Others	133 (38.3)
When should you wear a surgical mask or N95 mask during care for patients with COVID-19?	
During entire treatment and/or nursing care, if you are working within approximately 1 meter of a patient with COVID-19 influenza, and when the patient is on droplet precautions	138 (39.8)
During entire treatment and/or nursing care	70 (20.2)
If you are working within approximately 1 meter of a patient with COVID-19 influenza	46 (13.3)
During entire treatment and/or nursing care and when the patient is on droplet precautions	36 (10.4)
Are you willing to treat and/or care for patients with COVID-19 if you have the opportunity?	
Yes	249 (71.8)
No, if no because of:	98 (28.2)
Concern about the possible infection of yourself	12 (12.2)
Concern about the possible infection of your family members	50 (52.6)
Concern about the possible infection of yourself and family members	36 (36.7)

Table **3** shows the results of the attitude and behavior of nurses toward the COVID-19 outbreak. About 91% of nurses reported that they had adequate knowledge about the COVID-19 pandemic, 95.1% were confident that they understood the risks of the COVID-19 pandemic on patients and medical staff, and 93.9% were confident that they understood how to protect themselves and their patients during COVID-19 pandemic. Most of the nurses, 326 (93.9%) considered that hand hygiene includes either washing hands with soap and water or the use of an alcohol-based hand rub, 204 (58.8%) reported washing their hands with an alcohol-based hand rub when they were visibly soiled, and 211 (60.8%) believed that the use of correct PPE eliminates the need for hand hygiene. Most of the nurses, 316 (91.1%) believed that the use of PPE will protect the medical staff from getting COVID-19, 275 (79.3%) of the nurses believed that the use of PPE will protect patients from getting COVID-19, 210 (60.5%) considered using recommended PPE when taking care for patients with COVID-19 inconvenient, and 246 (70.9%) believed that using recommended PPE interferes with patient treatment or nursing care. About 23% of the nurses considered that recommended PPE was not readily available in their hospitals. Almost half of the sample reported that their colleagues often forget to use recommended PPE when taking care of patients with COVID-19, and 148 (42.7%) reported that they forget to change PPE between patients when taking care of patients with COVID-19.

Table 3. Attitude and behavior of jordanian nurses toward COVID-19 (N = 347).

-	Agree & completely agree Number (%)	Neither agree nor disagree, Number (%)	Disagree & completely disagree Number (%)
You understand the relevant knowledge of COVID-19	314 (90.5)	26 (7.5)	7 (2)
You are confident that you understand the risks of COVID-19 epidemic for the patients' and medical staff.	330 (95.1)	12 (3.5)	5 (1.4)

(Table) contd.....

You are confident that you understand how to protect yourself and your patients during COVID-19 epidemic.	326 (93.9)	17(4.9)	4(1.2)
Hand hygiene includes either washing hands with soap and water or the use of an alcohol-based hand rub.	326 (93.9)	14(4)	7(2)
Wash hands with an alcohol-based hand rub when they are visibly soiled.	204 (58.8)	15(4.3)	128(36.9)
The use of correct PPE eliminates the need for hand hygiene.	211 (60.8)	13(3.7)	123(35.4)
The use of PPE will keep the medical staff from getting COVID-19.	316 (91.1)	19(5.5)	12(3.5)
The use of PPE will keep patients from getting COVID-19.	275 (79.3)	42(12.1)	30(8.6)
It is inconvenient to use the recommended PPE when taking care of patients with COVID-1	210 (60.5)	34(9.8)	103(29.7)
Use of recommended PPE interferes with patient treatment and/or nursing care	246 (70.9)	29(8.4)	72(20.7)
All recommended PPE is readily available in your hospital.	266 (76.7)	33(9.5)	48(13.8)
Your head nurse or attending physician would blame you if you did not use PPE when caring for patients with COVID-19	285 (82.1)	29(8.4)	33(9.5)
You know when your patients are on COVID-19 precautions	305 (87.9)	34(9.8)	8(2.3)
Your colleagues often forget to use recommended PPE when taking care of patients with COVID-19	176 (50.7)	41(11.8)	130(37.5)
You will remove your PPE immediately when you leave the patients room	300 (86.5)	24(6.9)	23(6.6)
You often forget to change PPE between patients when taking care of patients with COVID-19	148 (42.7)	32(9.2)	167(48.1)
You believe that you can improve the compliance to recommended PPE	314 (90.5)	24(6.9)	9(2.6)

3.2. Predictors of Willingness to Provide Care to Patients with COVID-19 Infection

(Table **4**) shows the results of the binary logistic regression analysis in two models. In the first model, the covariates of age, gender, level of education, living status, marital status, job title, type of hospital, and department were introduced to the regression. In this step, we found that older nurses had a 6% lower odds of willingness to provide care to patients with COVID-19 (AOR= 0.94, p = .038, 95% CI [0.849-0.997]), controlling for other covariates. Divorced nurses also showed 97% lower odds of willingness to provide care (AOR= 0.03, p = .046, 95% CI [0.001-0.939]) controlling for other covariates. On the other hand, nurses who were head of a department reported five times higher odds of willingness to provide care (AOR= 5.02, p = .049, 95% CI [1.006-25.067]), holding other covariates constant. Male and female nurses did not differ in their willingness to provide care.

Table 4. Odds ratios, P values, and CI from logistic regression models predicting willingness to provide care to patients with COVID-19 among Nurses in Jordan, 2020.

Willingness to Provide Care to Patients with COVID-19							
Model One				**Model Two**			
Covariate	AOR	P-Value	95% CI	Covariate	AOR	P-Value	95% CI
Age	.94	.038	.849-.997	Age	.95	.067	.897-1.004
Male	.79	.444	.437-1.438	Male	.76	.366	.410-1.389
Marital status		.104		Marital status		.188	
Single	.13	.116	.010-1.664	Single	.21	.237	.016-2.770
Married	.21	.221	.016-2.585	Married	.36	.420	.029-4.386
Divorced	.03	.046	.001-.939	Divorced	.07	.114	.002-1.899
Job title		.163		Job title		.102	
Registered nurse	2.15	.267	.557-8.285	Registered nurse	2.52	.199	.614-10.342
In-charge nurse	3.57	.088	.826-15-414	In-charge nurse	4.50	.054	.975-20.779
Head of a department	5.02	.049	1.006-25.067	Head of a department	6.92	.026	1.267-37.734
Administrative	9.73	.058	.928-102.001	Administrative	11.32	.047	1.035-123.766
Type of hospital		.141		Type of hospital		.065	
Private	2.36	.099	.850-6.566	Private	2.95	.047	1.016-8.585
Governmental	1.21	.741	.393-3.721	Governmental	1.36	.604	.424-4.375
Educational	2.09	.265	.572-7.618	Educational	2.47	.188	.643-9.498
Department		.377		Department		.587	
Emergency room	.52	.176	.202-1.341	Emergency room	.63	.363	.235-1.699
Intensive care unit	.98	.962	.414-2.315	Intensive care unit	1.01	.979	.408-2.511
Medical-surgical ward	.52	.125	.225-1.200	Medical-surgical ward	.59	.234	.250-1.403

(Table 4) contd.....

Pediatric ward	1.09	.895	.302-3.927	Pediatric ward	1.32	.682	.349-4.991
Labor and postpartum wards	.97	.952	.339-2.764	Labor and postpartum wards	1.03	.962	.348-3.028
Clinics	1.11	.872	.299-4.147	Clinics	1.28	.721	.328-5.007
Administration	.15	.069	.020-1.160	Administration	.18	.100	.024-1.382
Level of education				Level of education			
Diploma or associate	.42	.104	.838-6.640	diploma or associate	.39	.088	.134-1.148
Living status			.345-3.388	Living status			
Living alone	.93	.894		Living alone	.81	.720	.251-2.599
				Have you finished the training program about COVID-19?	.62	.088	.359-1.074
				Have you had the experience treating or caring for patients with confirmed or suspected COVID-19?	.55	.034	.321-.955
				You understand the relevant knowledge of COVID-19.	1.25	.662	.465-3.334
				You are confident that you understand the risks of COVID-19 epidemic for the patients and medical staff.	.81	.726	.253-2.607
.				You are confident that you understand how to protect yourself and your patients during COVID-19 epidemic.	.38	.066	.132-1.068

In the second model, when the variables of interest were introduced to the regression, the age and marital status effect attenuated and became nonsignificant. Along with head of department (AOR= 6.92, p = .026, 95% CI (1.267-37.734)), another job title became significant predictor of the willingness; administrative nurses reported higher odds of willingness to provide care (AOR= 11.32, p = .047, 95% CI (1.035-123.766)), holding other covariates constant. Remarkably, 45% lower odds of willingness to provide care to patients with COVID-19 were among nurses who reported having experience in treating or providing care to patients with confirmed or suspected COVID-19 (AOR= 0.55, p = .034, 95% CI (321-.955)). Finally, nurses who worked in private hospitals had almost three times higher odds of willingness to provide care to patients with COVID-19 (AOR= 2.95, p = .047, 95% CI (1.016-8.585)). The two models of regression were statistically significant (p= 0.048, p= 0.002, respectively), and the overall second model fit (-2LL) was (361.8). Finally, the overall classification accuracy of the second model was (73.5).

4. DISCUSSION

The nursing profession necessitates that all nurses work directly and with patients and their families for an extended period. During the pandemic state, nurses need to consider themselves and others' safety and not be foci of infection that might accelerate the spread of the diseases. This study sought to assess the knowledge and attitudes of Jordanian nurses toward COVID-19 infection. Further, this study assessed' their willingness to provide care for patients with a COVID-19 infection.

Although COVID-19 is a newly emerged infection and there is a scarcity of protocols concerned with treating and managing it, nurses must be prepared to master their role as frontline caregivers. Our study found that 55% of the nurses completed a training program about COVID-19. This percentage was lower than the percentage (72.9%) reported by Shi, Wang [16] but higher than the percentage (7.6%) reported by Khader, Al Nsour [22] study that targeted dentists. Thus, further training programs targeting HCPduring COVID-19 are needed.

The majority of the nurses (71.8%) were willing to care for patients with COVID-19 infection. This percentage was higher than the Shi, Wang [16] study reported, where 55.4% of the nurses expressed their willingness to care for psychiatric patients with COVID-19 infection [16]. However, the percentage of willingness to give care to patients with COVID-19 in this study was lower than the percentage reported by Ma, He [23] study (82%); given that Ma *et al.* study focused on the H1N1 infection [23]. The difference might be explained by the lower infectivity and fatality of H1N1 compared with COVID-19 infection [24]. On the other side, 28.2% of the nurses in the current study were unwilling to provide care for patients with COVID-19 infection. Their concern was their worries about the transmission of the infection to their family members, and the such finding was consistent with Shi, Wang [16].

The nurses in this study used the internet as the primary source of information about COVID-19. This finding was consistent with several studies that reported the internet and social media as the primary sources of COVID-19 information [14, 16, 18, 19]. The use of the internet is worthy due to its low cost and easy accessibility; however, the information should be authenticated; otherwise, it may have devastating consequences on the community during the pandemic [25, 26]. It was found that 40% of medical information shared on social media is false, and 20% of them are hazardous [27]. The study of Waszak, Kasprzycka-Waszak [27] showed that nurses' responses concerning the proper use and when to use the safety measures to curb the infection were not consistent and varied. Similar to the study of Waszak *et al.*, the majority of nurses in our study considered surgical mask, N95 mask, gown, gloves, goggles, face shield, and hand hygiene as the correct PPE to be used and to wear a surgical mask or N95 mask during the entire treatment or nursing care if they are working within approximately one meter of a patient with COVID-19. The variation in participants' answers could be partially explained by the fact that many aspects of the disease are still unknown, and there has been new information being published about the virus that is still not clear. In addition, the precise mechanisms of its spread are not yet entirely clear [3].

Nurses' responses concerning the attitude and practice toward COVID-19 can be grouped into two categories. The first category included a high level of attitude and good practice: namely, understanding relevant knowledge about COVID-19, understanding the risk of COVID-19 on the patient and medical staff, confidence to protect self and patients, knowing patients on COVID-19 precautions, knowledge about alcohol hand-rub and hand washing and the use of correct PPE. The second category included a moderate level of attitude and good practice: namely, washing hands when they are visibly soiled, using PPE eliminates the need for hand hygiene, inconvenient to use the recommended PPE when taking care of patients with COVID-19, using recommended PPE interferes with patient treatment or nursing care, colleagues often forget to use recommended PPE when taking care of patients with COVID-19 and often forget to change PPE between patients when taking care of patients with COVID-19. This category requires excessive attention from hospital administrations to improve nurses' attitudes and practice while caring for patients with COVID-19. Hospital administrations are responsible for maintaining the availability of all recommended PPE. Despite the challenging financial constraints, hospitals need to provide a clear protocol to deal with COVID-19 infection since only two-thirds of nurses reported that PPE was readily available [9]. Such intervention from the administration may receive acceptance from nurses since 90.5% believed that they could improve compliance with recommended PPE. It is worth noting that the shortage of PPE is a global challenge with measures taken to tackle this problem. The WHO warned that this shortage is putting the lives of HCP at risk and made recommendations for the rational use of PPE and how decision-makers can respond in the case of severe supplies shortage [28, 29].

In our study, 71.8% of the nurses were willing to care for patients with COVID-19. Job title, type of hospital, and reported nursing experience in treating or caring for patients with COVID-19 were predictors of nurses' willingness to care for patients with COVID-19. Nurses in higher positions showed higher willingness could be inferred to their crucial rule in the management; these nurses feel that they are more willing to provide such care. In addition, nurses with former experience in caring for patients with COVID-19 showed a lower willingness to care for patients with COVID-19. This may be due to the lack of protecting devices needed for this service.

CONCLUSION

Jordanian nurses reported a good level of knowledge, attitudes, and behaviors toward COVID-19, and the majority of them were willing to provide care for patients with COVID-19. However, there were gaps in knowledge that required attention and training about using PPE and fear of transmitting the disease to family members.

IMPLICATIONS FOR PRACTICE

Nurses' managers should identify training priorities, provide training programs and information tailored to meet the needs of nurses during COVID-19 challenges and prepare them for any future pandemics. The training programs should be easily accessible, considering the hectic working environment during COVID-19. International collaboration to identify common training priorities, work on capacity-building solutions, speeding up development, adaptation, and dissemination means effective delivery of training and skills development (WHO, 2020d). Also, nurses' managers should act as role models for other nurses in their knowledge, attitude, and willingness to care for COVID-19 patients. Health institution administrators should ensure that all the necessary supplies and PPE are readily available in all health institutions and have a plan of action when there is a shortage of supplies during financial hardship. This calls for international collaboration between medical suppliers and governments to work together to tackle the global shortage of PPE. Also, easily accessible, valid, and reliable information sources that are relevant to the context and healthcare settings may decrease the ambiguity and uncertainty of nurses in information related to COVID-19.

LIMITATIONS

There were several limitations to this study. First, data collection was conducted using a self-reported questionnaire; therefore, there was a potential reporting bias. Further studies are needed to support these findings. Moreover, the used instrument has limited validity and reliability testing due to the emerging nature of the field where the underlying content is changing rapidly. Second, nurses' knowledge, attitudes, and practice were based on the available information about the newly emerging strain of SAR-COV-2 that causes COVID-19 infection. The available information keeps updated frequently, which may be associated with ambiguous attitudes and behaviors among nurses and other healthcare professionals.

LIST OF ABBREVIATIONS

HCPs = Healthcare professionals

SPSS = Statistical Package for Social Science

AUTHORS CONTRIBUTION

We confirm that all listed authors meet the authorship criteria.

All authors have made substantial contributions to all of the following: (i) conception and design, or analysis and interpretation of data; (ii) drafting the article or revising it critically for important intellectual content; and (iii) final approval of the version to be published.

All authors approved the final version for submission.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The ethical approval was obtained from the scientific and research committee at Al-Ahlyyia Amman University-Faculty of Nursing.

HUMAN AND ANIMAL RIGHTS

No animals were used in this research. All procedures performed in studies involving human participants were in accordance with the ethical standards of 1975 Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants.

STANDARD OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data and supportive information is available within the article.

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