Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Nursing knowledge and perceptions of COVID-19 pandemic in Jordanian intensive care units

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ABSTRACT

Objectives: The goal of this study was to find out the level of knowledge and perception among the nurses in intensive care units (ICUs).
Methods: The study was set up in a cross-sectional design. During the COVID-19 pandemic, nurses completed a self-reporting questionnaire to assess their knowledge and perception of the pandemic. 182 ICU nurses were asked for information. We used statistical analyses that were both descriptive and inferential.
Results: There was a statistically significant link between nurses' knowledge and their years of experience ($r = 0.15$, $p = .03$), their experience with COVID-19 infection ($r = 0.83$, $p = .01$), and having a first-degree relative who had COVID-19 ($r = 0.17$, $p = .02$). Also, nurses knew a fair amount about COVID-19. There was a statistically significant link between how nurses felt and how they were trained to care for COVID-19 patients ($r = 0.15$, $p = .034$), nurses who had COVID-19 infection ($r = 0.30$, $p = .001$), and having a first-degree relative who had COVID-19 infection ($r = 0.18$, $p = .014$).
Conclusion: The Jordanian nurses' understanding of COVID-19 disease is categorized as average because the majority of their responses ranged between 56 % and 86 %. The nurses' knowledge was related to their length of experience in the field, and their perceptions were related to how they had been trained to care for COVID-19 patients.

Implications for clinical practice

- COVID -19 signs and symptoms, transmission, treatment, and those at risk were all topics on which nurses had a fair amount of knowledge
- Working in the ICU with COVID-19-infected patients necessitates the use of competent nurses.
- The main challenges facing nurses during the pandemic were a scarcity of skilled nurses providing care for COVID-19 patients in COVID-19 ICUs.

1. Introduction

The coronavirus disease (COVID-19) is an infectious disease that affects the respiratory system. It was first seen in Wuhan, China (Wang et al., 2020). The COVID-19 outbreak was first called a Public Health Emergency of International Concern by the World Health Organization (WHO). On March 11, 2020, it was called a pandemic (WHO, 2020). Jordan was one of these places that saw the COVID-19 pandemic spread. The number of infected people slowly went up until September 29, 2021, when there were more than 700,000 infected people, of whom 9530 died from COVID-19.

Working in the intensive care units (ICU) with COVID-19-infected patients necessitates the use of competent nurses. According to ICU nurses, a lack of clinical skills and expertise resulted in dangerous and ineffective patient care (Rezaee et al., 2020a, 2020b). A variety of factors affected how well nurses performed. The primary difficulties faced by nurses during the pandemic included a lack of qualified nurses caring for COVID-19 patients in COVID-19 ICUs, a lack of medical supplies, and a concern for contamination (Alnuqaidan et al., 2021; Legido-Quigley et al., 2020). Nurses' knowledge was related to their years of experience (Saber et al., 2021; Shi et al., 2020), level of education, age, and gender (Wake, 2020), while nurses with bachelor's degrees, expertise in clinical COVID-19 prevention, and gender differences were more aware of the COVID-19 pandemic (Al-Dossary et al., 2020).

A cross-sectional study in Jordan evaluated the familiarity of

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healthcare professionals (HCW) with the COVID-19 pandemic (including 90.7 % of nurses). It was found that the majority of the HCW had received training to handle COVID-19 patients, that they were quite knowledgeable about the COVID-19 response strategy and procedures, and that they had received training to deal with COVID-19 patients (Al-Faouri et al., 2021). Apart from their responsibility for their jobs during the pandemic, Abuhammad et al. (2021) concluded that nurses had a favorable impression of their role in the COVID-19 pandemic. Another study conducted in Jordanian hospitals during the COVID -19 pandemic indicated that a lack of resources and qualified staff in ICUs and isolation units, as well as work stress and fear of infection, might all have an impact on the quality of health care, resulting in a significant problem (Al-Dweik & Ahmad, 2020).

There were few studies that examined the experiences of nurses who were in charge of providing COVID-19 patients with medical care (Galehdar et al., 2021; Hani & Ahmad, 2022). The goals of this study were to: a) measure nurses' knowledge and perceptions of the COVID-19 infectious disease, b) investigate the relationship between nurses' characteristics and their knowledge and perceptions, and c) identify challenges they encountered while working in ICUs with the pandemic.

2. Methods

2.1. Study design

A cross-sectional design was used for collecting data from nurses working in ICUs by distributing a self-report questionnaire during the COVID -19 pandemic. Data collection during the pandemic period was challenging for a variety of reasons, including the fact that researchers were not permitted to enter areas with infected cases and nurses who were caring for patients who had COVID-19 were hard to reach. A cross-sectional design was therefore the most suitable under such unusual circumstances.

2.2. Setting

The data were collected from three hospitals: one governmental, one educational, and a private hospital. Those hospitals represent all the health care sectors in Jordan except the military hospitals. To obtain permission from military hospital for research purpose is time consuming and high likely not to be granted for security considerations.

2.3. Sample

All nurses working in ICUs and dealing with COVID 19 patients were candidates to be included in this study. Using the G*Power software (Faul et al., 2007) was used to calculate the sample size for nurses by using Pearson correlation based on the following criteria: effect size (0.25), alpha (0.05), and power (0.80); thus, the minimum sample size required was 122 nurses, the actual collected sample was 182 self-report questionnaires.

2.4. Eligibility criteria

All nurses who worked in ICUs in the selected hospitals and dealt with COVID -19 infected patients were invited to participate. Nurses who worked in different departments were excluded from this study.

2.5. Ethical consideration

The scientific study committee of the School of Nursing, [XXX], and the Institutional Review Board (IRB) of the selected hospitals provided ethical approval. In addition, the head of the ICU gave his verbal agreement for the questionnaire to be sent to the nurses, and ICU staff gave their written consent. Anonymity and confidentiality were guaranteed. The questionnaire printout was also kept in a secured cabinet.

2.6. Data collection

A self-report questionnaire was distributed to nurses who were working at the three selected hospitals. The principal investigator (PI) distributed the questionnaires to nurses in ICUs after providing them with a cover letter that contained a brief description of the study's purpose. The participation was voluntary. Each participant filled out the questionnaire separately. The nurses needed an average of 10 min to fill out the questionnaire. Data collection began on February 9th, 2021 until June 13, 2021.

3. Measures

A self-report questionnaire was developed and adopted from previously published studies as guidance (Addis et al., 2021; Patidar et al., 2020; Saadeh et al., 2021) to assess knowledge and perceptions of COVID-19 infectious disease among nurses in ICUs.

A self-report questionnaire consisted of 30 items divided into three parts. The first part consisted of items concerning nurses' characteristics (age, gender, level of education, years of experience, received training on dealing with COVID-19 patients, infected first-degree relatives, and fear of dealing with COVID-19 patients), in addition to hospital type. The second part consisted of 9 items about the nurses' knowledge of the COVID-19 virus, clinical signs and symptoms, route of transmission, treatment of infected patients, and high-risk people. The questions about nurses' knowledge consisted of nine items and were graded on the Likert scale ranging from (0 = I do not know, 1 = no, 2 = yes). The correct answer was given 1 point, while incorrect/unknown answers were given zero points, except for item 5 is a reversed question. Thus, the range score was between 0 and 8. The third part consisted of 14 items about nurses' perceptions, including 14 items on the Likert scale ranging from (0 = no, 1 = yes). The total score ranged from 0 to 14.

3.1. Validity of the measure

Face validity was established in step one by five healthcare professionals who reviewed the initial draft of the questionnaire and suggested improvements based on their responses. The content validity index (CVI) was created in step two by submitting three master's degree-holding experts that worked in the clinical sector (ICU head nurses, an infection control nurse, and a supervisor) at hospitals that handled COVID-19 patients and had 15–25 years of experience. The questionnaire was presented in its first version to ensure that the items were relevant and understandable. The CVI for this study was.93.

3.2. Reliability of the measure

Cronbach's alpha is one of the most extensively used dependability indicators in the social and organizational sciences; it estimates the instrument's internal consistency (Bonett & Wright, 2015). In this study, a three-part questionnaire was sent to 182 nurses. The knowledge' subscale consisted of 9 items ($\alpha = 0.66$), and the perception' subscale consisted of 14 items ($\alpha = 0.68$). Cronbach's alpha was considered moderate but acceptable according to the range between 0.60 and 0.80 (Daud et al., 2018).

3.3. Pilot study

A pilot study was conducted to examine the practicality and clarity of the research tools, to identify and assess the sample population, and to ascertain the tools' applicability to Jordanians. Additionally, to estimate the time required to finish the self-report questionnaire, as well as to assess the tool's readiness, item clearance, and any potential difficulties. The pilot study included 15 critical care nurses in total. The questions were answered by the nurses in about 10 min. Around 10 % of the sample was made up of participants in the pilot project, but they were

excluded from the analysis of the study.

4. Results

4.1. Characteristics of nurses

This study included 182 ICU nurses who provided care for COVID-19-infected patients in ICU. The Jordan Ministry of Health designated public hospitals to offer care for patients with COVID-19, therefore nearly half of the sample (48.9 %) came from them. About half of the participants were women (52.2 %). The majority of the nurses held bachelor's degrees (82.4 %). The average number of years of experience was 5.90 (SD = 4.83). ICU nurses hold a variety of scientific credentials (master's, bachelor's, and diploma). According to the job description, each of them has specific responsibilities. Nurses are also given ongoing training to deal with serious patient circumstances. Nurses who had been trained to deal with COVID-19 patients made up 87 % of the total. COVID-19 was found in about 57 % of nurses. Nearly two-thirds of the individuals (64.8 %) had first-degree relatives infected with COVID-19. Furthermore, nearly half of the nurses (50.5 %) expressed apprehension when dealing with COVID-19 patients (Table 1).

4.2. Nurses' knowledge and perceptions regarding COVID-19

The questions about nurses' knowledge and perceptions are organized from the highest accurate response percentages to the lowest, as shown in Table 2. The questions about nurses' knowledge that received no or I don't know responses were merged. The question about COVID-19 high-risk patients had the highest percentage of responses (86.3 %). The majority of nurses (85.2 %) correctly answered the question about COVID-19's main clinical symptoms. The percentage of patients with COVID-19 who received successful treatment was 84.1 %. Almost three-quarters of the nurses (74.2 %) correctly identified the social distance that should be maintained from other persons to avoid infection. In addition, 73.1 % of infected patients responded to the less common symptoms of COVID-19 infection. Furthermore, when asked how long it takes for COVID-19 symptoms to show on infected patients, 62.6 % of nurses responded. Sixty-four percent of nurses were aware of the COVID-19 virus's name. Moreover, 56.6 % of nurses were aware that COVID-19 can be spread through the air. Only 53.3 % of respondents correctly responded whether antibiotics were unsuccessful in preventing and treating the new coronavirus, the question with the lowest percentage of right answers.

Table 1
Characteristics of nurses working in ICUs (N = 182).

Variables	N	%
Gender		
Male	87	47.8
Female	95	52.2
Level of education		
Diploma	12	6.6
Bachelor	150	82.4
Master	20	11.0
Years of experience		
Mean 5.90 ± 4.83 years		
Received training on how to deal with COVID-19 patients		
No	75	41.2
Yes	107	58.8
Infected of the first-degree relative		
No	64	35.2
Yes	118	64.8
Infected with COVID-19		
No	78	42.9
Yes	104	57.1
Fear of dealing with COVID-19 patients		
No	90	49.5
Yes	92	50.5

Table 2
Nurses' knowledge and perceptions regarding COVID 19 (N = 182).

Nurses' knowledge			Nurses' perceptions		
Questions	Yes		Questions	Yes	
	N	%		N	%
Old-age people with underlying medical problems like high BP, heart problems, or diabetes are more likely to develop serious illnesses.	157	86.3	Do you know how to correctly put on (donning) and take off (doffing) PPE?	157	86.3
The main clinical symptoms of COVID-19 are fever, cough, shortness of breath, and fatigue.	155	85.2	Has the shortage of respiratory therapists increased your responsibility to be more knowledgeable about oxygen therapy?	154	84.6
Currently, there is no effective treatment for COVID-2019, but early symptomatic and supportive treatment can help most patients recover from the infection?	153	84.1	Patients had a panic attack when changed the planning of treatment (e.g., change O2 therapy due to patients' condition), which make difficulties in providing care	150	82.4
COVID-19 virus related to SARS-coronavirus.	110	60.4	Are you obliged to go to work when you are sick, or you are not feeling well?	96	52.7
COVID-19 can be transmitted through the air.	103	56.6	Did you receive training on the types of oxygen therapy newly used in treating COVID-19 patients (High flow nasal cannula, Jet nebulizer)?	87	47.8
Antibiotics are NOT effective in preventing and treating the novel Coronavirus.	97	53.3	Do you still fear dealing with COVID-19 patients because you do not have sufficient knowledge?	72	39.6

The nurses had a positive attitude on the use of personal protective equipment (PPE) (86.3 %). Due to a dearth of respiratory therapists, nurses' responsibilities have grown (84.6 %). When treatment plans were revised, the majority of the patients (82.4 %) experienced a panic episode. PPE was worn by a large percentage of the nurses till the end of the shift (81.3 %). Because of the scarcity of intensive care specialists, the majority of nurses (80.8 %) have increased their responsibilities. Unfortunately, nearly 80 % of nurses would prefer to be treated at home if they or their families were infected with COVID-19. The lack of other nurses' expertise and practice in ECG interpretation harmed the care of COVID-19 patients, according to 72 % of nurses. In addition, the nurses discovered that a lack of expertise of ABG analysis and interpretation had a 69.2 % impact on the management of COVID-19 patients. Approximately two-thirds of nurses (65.4 %) thought that healthcare facilities had effective processes and capacities to receive COVID-19-infected patients. Nurses believe that one of their relatives or themselves getting afflicted with COVID-19 boosted their understanding (79.7 %). The COVID-19 awareness training was attended by more than half of the nurses (61 %). Unfortunately, 52.7 % of nurses were required to work if they became ill. The new type of oxygen therapy was not taught to more than half of the nurses (52.2 %). Due to a lack of understanding, about 39.6 % of nurses still worried working with COVID-19 patients.

4.3. Relationship between nurses' knowledge, perceptions, and characteristics

The results in Table 3 shows that there was a statistically significant

Table 3
Correlation between nurses' knowledge and their characteristics.

	Knowledge	Perceptions
Variables	r	r
Gender	0.02	−0.01
Level of education	0.04	0.12
Years of experience	0.15*	0.07
Received training on how to deal with COVID-19 patients	0.07	0.15*
Infected of the first-degree relative	0.83*	0.18*
He\she infected with COVID-19	0.17*	0.30*

* $p < .05$.

positive relationship between nurses' knowledge and their years of experience ($r = 0.15$, $p = .03$), the experience of COVID -19 infection ($r = 0.83$, $p = .01$), and having a first-degree relative of infected with COVID -19 ($r = 0.17$, $p = .02$). No statistically significant relationship was found between the nurses' knowledge and gender, education level, and the nurses who had received training in caring for COVID -19. Furthermore, nurses' perception had a statistically significant positive relationship between training in caring for COVID-19 patients ($r = 0.15$, $p = .034$), nurses infected with COVID -19 ($r = 0.30$, $p = .001$), and first-degree relatives infected with COVID -19 ($r = 0.18$, $p = .014$).

5. Discussion

The COVID-19 pandemic has transformed the role of the nurse to better meet the needs of patients and their families. However, the range of practice for Jordanian nurses in the ICU is nearly identical to that of nurses from other nations. ICU nurse's duties include assessing a patient's health, delivering care, and being there for them continuously until they recover (Emami Zeydi et al., 2022; Fadda & Ahmad, 2021). Respond to a medical emergency and, if necessary, notify the proper doctors. Before transferring a patient, all required paper and electronic work must be finished.

Nurses' knowledge in this study had a statistically significant relationship with their experience, which is consistent with a Chinese study (Shi et al., 2020), but not with the Iranian study by Nemati et al. (2020). This could be interpreted as work experience can affect nurses' awareness, preventive behavior, and perceptions, which leads to better patient outcomes (Al-Dossary et al., 2020; Al-Dweik & Ahmad, 2019, 2020). Only 56.6 % of respondents, however, claimed that COVID 19 was transmitted by air. This is a crucial issue that shows how little information nurses have about infection management. Therefore, policymakers and educators must take measures to provide more information about this to Jordan's nursing education. Infection control is a significant aspect of nursing education.

Nurses' perceptions were statistically related to their experience with COVID-19, having a first-degree family infected with COVID-19, and getting COVID-19 patient care training. This could be attributed to the fact that there were few symptomatic patients in Jordanian hospitals at the start of the pandemic, exposing relative nurses at home to COVID-19 infection from asymptomatic family members. In addition, nurses are believed to be able to care for ill family members at home, hence increasing their risk of infection. Furthermore, the COVID19 educational program and COVID-19 experience enhance awareness of infection prevention. However, prior research should be read with caution due to the use of diverse procedures and subjects, which may have affected degrees of awareness and perception (Al-Dossary et al., 2020).

This study found no significant association between gender, educational level, and nurses' expertise, which is consistent with research conducted in Saudi Arabia, India, and five Arab countries by Al-Dossary et al. (2020). In a study similar to ours, Nemati et al. (2020) found that gender, education level, and experience had no effect on perception score.

The majority of nurses in this study had adequate experience with wearing and doffing PPE, similar to findings from previous studies in Jordan and Lebanon (Al-Faouri et al., 2021; Saadeh et al., 2021). This could be due to the COVID-19 training they received; enhanced nurse understanding to defend oneself. Furthermore, when dealing with COVID -19 patients, Jordanian hospitals follow the World Health Organization's international rules and procedures (Samrah et al., 2020). Contrary to the findings of the Lebanese study, participants in this survey believed the hospital had effective processes and the capacity to admit a COVID- 19 patient (Saadeh et al., 2021). This might be as a result of Jordanian hospitals being adequately equipped with medical supplies to receive and treat COVID-19 victims during the pandemic (Al-Khrabsheh et al., 2022).

Health workers in low- and middle-income nations are working longer hours and are more likely to experience burnout due to a shortage of resources and health personnel (Alhalaseh et al., 2021). This was confirmed by participants' perceptions in our study that their responsibilities in ICUs were increasing due to a shortage of specialists. However, more than half of nurses were not trained in the new type of oxygen therapy, which could cause the treatment plan to be delayed. Furthermore, the nurses in this study reported that a lack of nurse education and skills had an impact on patient care, which is consistent with findings from an Iranian study (Rezaee et al., 2020a, 2020b).

Unfortunately, like the Lebanese participants, nurses had to work even when they were sick, which added to their workload. This was because there were not enough trained nurses to care for patients alone in ICUs (Saade et al., 2021). Some nurses are still unwilling to care for patients who are infected. If a pandemic occurs in the future, nurses will therefore need psychological support in addition to greater training in caring for patients with infectious diseases (Legido-Quigley et al., 2020).

5.1. Strengths and limitations

The results of this study could be helpful to policymakers in highlighting the additional challenges that nurses faced while working in ICUs during the epidemic. It is possible that administrators may reevaluate their strategies in order to improve the level of care provided to infected patients in ICUs and to better prepare nurses for a potential future pandemic. It is possible that the findings of this study would have been different if the researchers had looked at a greater number of hospitals.

6. Conclusion and implications

COVID-19's signs and symptoms, transmission, management, and individuals at risk were all areas that the nurses were well-versed in. Nurses also admitted to having a variety of views on the use of personal protective equipment (PPE). Patients suffered because of the nurses' inexperience and lack of competence in reading electrocardiograms and arterial blood gases. In this study, the obstacles faced by Jordanian nurses during the emergence of COVID-19 were also examined. Nurses' abilities were boosted by their years of experience in the field.

CRediT authorship contribution statement

Fatima Aryan: Conceptualization, Methodology, Writing- Original draft preparation.

Muayyad ahmad: Data curation, Software, Writing- Original draft preparation, Visualization, Investigation, Supervision, Validation, Writing- Reviewing and Editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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