

## Evaluation of nurses' professionals on issues related to preventing and awareness regarding COVID-19 infection: A cross-sectional survey from a developing country from a developing country

Essa Swiety<sup>1,\*</sup>, Ahmad Salahat<sup>2</sup> & Loai Zabin<sup>3</sup>

<sup>1</sup> Intensive Cardiac Care Unit Nurse, Cardiology Department, An-Najah National University Hospital, Nablus, 44839, Palestine. <sup>2</sup> Intensive Care Unit Nurse, Medical Department, An-Najah National University Hospital, Nablus, 44839, Palestine. <sup>3</sup> Chief Nursing Officer, An-Najah National University Hospital, Nablus, 44839, Palestine.

\*Corresponding authors: e.swiety@najah.edu

Received: (14/9/2022), Accepted: (25/12/2022)

### Abstract

**Background:** An emerging public health issue, coronavirus disease 2019 (COVID-19), is threatening the lives of more than 2.4 million people globally. The current study assessed Palestine's nurses' knowledge, attitudes, and practices (KAP) regarding COVID-19. **Methods:** An online cross-sectional descriptive study was undertaken through social media. The KAP in the approaching COVID-19 virus was evaluated using an approved questionnaire. Bloom's cut-off of sufficient knowledge, positive attitude, and good practice used high or equal median utility indexes. All analyzes were performed using SPSS. **Results:** the 353 nurses that were entered. The participants' ages ranged from 25 to 35, with a median age of 26, and the majority were male ( $n = 195$ , or 55.2%). The mean knowledge score was 19.1 with a standard deviation of 2.98, and the median knowledge score was 19.0 with an interquartile range (IQR) of 18.0 to 21.0. The total score for knowledge was 25. The interquartile range for the attitude score was 16.0 to 21.0, with 18.0 as the median, and the mean attitude score was 18.3 (SD = 3.7), giving the overall attitude score of 26. 24 was the final practice score. The mean practice score was 9.9 (SD = 2.4), and the median practice score was 9.0, with an interquartile range of 8.0 to 11.0. Overall, 66% ( $n = 233$ ) had sufficient knowledge, 39.1% ( $n = 138$ ) had a positive attitude, and 27.5% ( $n = 97$ ) had good practice with COVID-19. Demographics and work-related issues statistically weigh much as female nurses had better preventive practice than male nurses ( $p < 0.05$ ), and the age of nurses (experienced nurses) had a significant impact on the prevention and perception domains of COVID-19 ( $p < 0.05$ ). **Conclusions:** The study showed sufficient knowledge, positive attitude, and nurses have good prevention practices for COVID-19. However, there is no significant value, but there are still deviations or deficiencies in the nurses' understanding of certain important attitudes and the adoption of relevant preventive measures; tailored health education programs are advised to improve levels of attitudes and practices.

**Keywords:** COVID-19 virus, KAP, Palestine, health care workers.

### INTRODUCTION

On December 31, 2019, cases of fever, cough, dyspnea, and pneumonia-like symptoms without known causes were reported to the World Health Organization (WHO). The detected microorganism is the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which shows low pathogenicity and is highly infectious [1, 2]. The WHO declared the COVID-19 outbreak a global health emergency in December 2019. [3]. On March 11, 2020, it was considered a global pandemic [4].

On May 03, 2020, seven persons were infected with COVID-19 in Bethlehem by the government of Palestine, which resulted in the announcement of a state of emergency for 30 days in Palestine [5].

Meanwhile, during this emergency state, in a struggle to restrict this pandemic crisis, extensive preventive measures (i.e., self-home quarantine, and performing COVID-19 screening tests for any suspected people) were taken to attempt to avoid overwhelming the state's shortened economic and health capabilities. Lack of vaccination and/or definitive

therapy for COVID-19 asserts the value of nonpharmacological precautionary steps as the only way to fight the COVID-19 pandemic. In Palestine, mortality and morbidity progressed to more than 75,326 and 650, respectively, and 972 cases involved healthcare providers infected by COVID-19 when the document was written, as documented by the Ministry of Health (MOH) [6].

Healthcare professionals are considered first-line fighters at risk of pathological dangers, extended duty hours, psychological overwhelmingness, exhaustion, burnout, possible stigma, and physical assault [7]. The COVID-19 pandemic has become a considerable threat to global health, and healthcare professionals and personnel in the Palestinian state have been extremely affected. Healthcare professionals in all domains and levels, especially nurses, care for clients diagnosed with this extremely contagious microbe [8]. It is well known that the virus communication process between nurses is strongly linked to crowding, the shortage of needed isolation facilities and supplies, and contamination of working areas. In addition, some nurses lack sufficient knowledge and awareness of infection prevention, and COVID-19 has put nurses’ health at serious occupational risk due to their constant contact with sick clients. The literature review proposes that having nurses deficient in knowledge can lead to a slowed diagnosis, intense and rapid virus spread, and insufficient infection preventive measures [8].

Regarding COVID-19 symptomatology, some patients may not experience any symptoms, while others may experience minor ones. Approximately 80% of infected clients recover without requiring any particular management or care; however, one in every six infected clients experiences more severe symptoms, which may include, but are not limited to, dyspnea (mostly in those of older age or with occult medical issues, hypertension, diabetes mellitus, or cardiac diseases) [9, 10]. Furthermore, young adults are not invulnerable to coronavirus; global statistics have shown that fewer infected patients requiring hospital admission have been younger [11-13].

Knowledge of the illness process can impact nurses’ attitudes and practices, and improper acknowledgment and inappropriate attitudes and practices can fully escalate infection risk [14] [15]. Continuous media epidemic broadcasting can affect attitudes toward this epidemic danger [14, 16]. Recognition of nurses’ KAP aids in anticipating programmed act results. For these reasons, this current study was designed to explore and investigate the KAP of Palestinian nurses towards COVID-19 between August and November 2020. When nurses’ KAP about COVID-19 can be evaluated during the pandemic’s early stages, this reveals data to direct nurses on how to deal safely and effectively with this virus.

## **METHODOLOGY**

### ***Research design***

This cross-sectional, descriptive, and observational research was conducted among Palestinian nurses from August to December 2020.

### ***The setting of the study and population***

The study was conducted in Palestine (West Bank, Gaza Strip). It included various types of work areas, with the target population including all nursing careers: Ph.D. in nursing, Master’s in nursing, registered nursing, licensed practical nursing, and nurse’s aides, among others.

### ***Sample and sampling***

The study information was collected using an online questionnaire. Data collection began from August 01 to December 01, 2020; the main practical method to distribute the survey was during the government-announced closure and movement restrictions. The questionnaire was generated with "Google Forms" ([www.google.com/forms](http://www.google.com/forms)). The sample size of 353 participants was calculated using the online Raosoft sample size calculator tool (<http://www.raosoft.com/samplesize.html>), in which the confidence level was 95%, and the error margin was 5%. A total of 353 participants were included in this investigation.

### ***Ethics approval***

The Institutional Review Board (IRB) of An-Najah National University (NNU) in Palestine approved the current study.

### ***Study tool***

The questionnaire was created using standard methods, including a literature review, pilot research, group discussions, domain expert evaluation, and questionnaire item validation. [17-19]. Despite the shortfall of the globally available literature on the evaluation and assessment of nurses' knowledge, attitudes, and practice when dealing with COVID-19, the needed data and information was collected by reviewing the current literature concerning the assessment of KAP for SARS and MERS [20-24], and European Center for Disease Prevention and Control (ECDC) and the Centers for Disease Control and Prevention (CDC).

The research questionnaire was verified by four interdisciplinary professionals with experience in research and epidemiology and resulted in some rephrasing based on their evaluation. Furthermore, additional modifications were made to a pilot study performed among nurses in various healthcare facilities, and we made the required change. Finally, The finished English version was translated into Arabic so nurses could fully comprehend the survey.

The final questionnaire contained four sections that examined nurses' socio-demographic data and their knowledge, attitudes, and practices. Thirty-three questions were used as multiple-choice, closed- and open-ended questions. The first socio-demographic section involved six questions about age, sex, workplace, years of experience, qualification, and information sources about COVID-19. The second component consisted of 13 questions concerning the etiology of COVID-19 that evaluated the nurses' knowledge of the condition, virus-host, incubation period, symptoms, ways the virus can be transmitted, control and prevention methods, vulnerable groups, mortality rate and resources for COVID-19 information. Again, the answers were neither "yes," "no," or "I do not know." The third section evaluated nurses' attitudes in terms of COVID-19 via six questions and the answer choices: "strongly disagree," "disagree," "not sure," "agree," or "strongly agree." Finally, the fourth section contained six questions in which the practices toward COVID-19 were assessed. The questions assessed the preventive actions adopted by nurses, includ-

ing proper cough and sneezing etiquette, dedication to putting on face masks and maintaining a certain distance, avoidance of public areas, limiting travel from one governorate to another, and maintaining self-hygiene practices. The questions offered were answered frequently, either as 'always,' 'often,' 'rarely' or "never."

### **Operational definitions**

#### *Knowledge of COVID-19*

Nurses' knowledge was evaluated via an 11-item questionnaire adapted for nurses by Zhong et al. [19]. Each correct response was given 1 mark, and a 0 mark was given for each incorrect answer. The increased points indicated higher levels of the nurses, with a cut-off level of 19 (median) recognized as sufficient nursing knowledge and < 19 points considered insufficient knowledge [19].

#### *Attitude concerning COVID-19*

Attitudes were evaluated using a five-item Likert scale, questions cited and utilized from Goni et al. [25], and modified to suit the COVID-19 study's objectives. The responses, which ranged in weight from 1 to 5, were "strongly disagree," "disagree," "neutral," "agree," and "strongly agree. Nurses were classified into two groups (high or equal), using the median utility indexes reported by positive attitude [26, 27].

#### *Practice preventing COVID-19*

The practices established by the international WHO and the local Palestinian MOH were evaluated using five-item Likert scale questions. These practices for COVID-19 prevention included hand hygiene, sidestepping, crowded sites, maintaining social distance (one meter away), decreasing facial contact, and handshaking avoidance. The answers were as follows: 'always,' 'occasionally' and "never," with each question given 4, 3, 2, or 1 point, respectively. Furthermore, nurses were categorized into two groups, high or low, using median utility indexes (high or equally reported by good practice) [26, 27].

### **Statistical analysis**

All information collected was analyzed using the Statistical Package for Social Sciences software (IBM SPSS Statistics version 22). The data were reflected in descriptive statistics. There were 30 questions in the knowledge scale that identified nurses'

knowledge about COVID-19, its symptomatology, and ways of preventing internal consistency (Cronbach's alpha = 0.577). After answering questions with several different choices, the 25 items' right responses were completed, and one score was given for each. With an adequate knowledge level, a sufficient knowledge scale was created (AKL), scoring < 19 (median). Chi-square testing was used to determine the socio-demographic variables associated with Bloom's cut-off of the sufficient knowledge scale, positive attitude, and good practice using the median utility indexes (high or equal, reported by good practice) [26]. Descriptive statistics, which consisted of frequency distribution, proportion, median, percentage ratios, and IQR, were used to describe non-normally distributed data, the Mann-Whitney U test was used to compare two or more independent samples, and the Kruskal-Wallis test was used to compare two or more independent samples.

## RESULTS

### *Socio-demographic characteristics*

An overall of 353 nurses completed the study questionnaires. The mean age of the study participant was 27±5.6 years; 153 participants (43.3%) were younger than 25 years, 115 (32.6%) were aged between 25 and 30

years, 56 (15.9%) were 30–35 and 29 (8.2%) were older than 35 years. Among those currently involved, 55.2% ( $n = 195$ ) were men, and 44.8% ( $n = 158$ ) were female. Less than 2 years of experience in nursing numbered 117 (33.1%), those with two to five years were 103 (29.2%), those with five to ten years were 89 (25.2%), and those with more than ten years of experience amounted to 44 (12.5%). The majority of the participants worked in private hospitals ( $n = 167$ ; 47.3%), 153 (43.3%) in government hospitals, a minority ( $n = 26$ ; 7.4%) in primary health care, and seven (2%) in UNRWA Hospital. The great majority of the 353 participants ( $n = 209$ ; 59.2%) were registered nurses, 55 (15.6%) were practical nurses, 74 (21%) had Master's degrees in nursing, six (1.7%) had Ph.D. degrees in nursing, and nine (2.5%) were nurse aides. The primary sources of information about COVID-19 for nurses were data and instructions from global health institutions, such as CDC and WHO, and locally from the Palestinian MOH, Palestinian media channels, newspapers, social networks (that is, WhatsApp, Facebook, etc.), and journals with 24% higher than others. Table 1 presents the social demographic data for the nurses in this study.

**Table (1):** Participants' demographics ( $n = 353$ ).

Demographics	Number (%)
<b>Sex</b>	
Male	195 (55.2)
Female	158 (44.8)
<b>Age</b>	
≤ 25	153 (43.3)
>25-30	115 (32.6)
>30-35	56 (15.9)
>35	29 (8.2)
<b>Experience</b>	
< 2	117 (33.1)
< 2-5	103 (29.2)
< 5-10	89 (25.2)
< 10	44 (12.5)
<b>Place of work</b>	
Government Hospital	153(43.3)
Private Hospital	167 (47.3)
primary health care	26 (7.4)
UNRWA Hospital	7 (2)
<b>Qualification</b>	
PhD	6 (1.7)

Demographics	Number (%)
Master in Nursing	74 (21)
Registered nurse	209 (59.2)
Practical nurse	55 (15.6)
Aid nurse	9 (2.5)
<b>Resources of corona viruses' pertinent information:</b>	
-Official global medical Organisation sites and media, including the World Health Organization and CDC.	231 (65.4)
-Official governmental websites and media (i.e., Ministry of Health)	185 (52.4)
-News on media (i.e., TVs, radios, Magazines, Newspapers)	135 (38.2)
-Social-Media applications, including: " Facebook, Twitter, Instagram, and WhatsApp."	164 (46.5)
-Journals	85 (24.1)

### Knowledge

(Yes = 1 [true answer], No = 0 [false answer]), as shown in Table 2.

The knowledge concerning COVID-19 was assessed using 14 questions, and a numerical weight was given to each item asked item

**Table (2):** Nursing knowledge during the Coronavirus outbreak

Asked questions	True n (%)	False n (%)	I do not know n (%)
Does coronavirus the same as influenza viruses?	80(22.7)	271(76.8)	2(0.6)
Can infected persons with the coronavirus be asymptomatic?	313(88.7)	37(10.5)	3(0.8)
What is the time for the infected persons with coronavirus to show signs & symptoms after getting the infection?			
< 7 days	105(29.7)		
From 1 to 14 days	224(63.5)		
From 2 to 21 days	13(3.7)		
From 1 to 3 months	5 (1.4)		
"I do not have an idea."	6 (1.7)		
What are the primary clinical signs and symptoms of coronavirus?			
To get feverish	342 (96.9)	11 (3.1)	
Headache	303 (85.8)	50 (14.2)	
Myalgia (muscle pain)	170 (48.2)	183 (51.8)	
Fatigue	247 (70)	106 (30)	
Sore throat	204 (57.8)	149 (42.2)	
Runny nose	69 (19.5)	284 (80.5)	
Sneezing	59 (16.7)	294 (83.3)	
Diarrhea	205 (58.1)	148 (41.9)	
Dry Cough	287 (81.3)	66 (18.7)	
Confusion	69 (19.5)	284 (80.5)	
Breathing difficulty	260 (73.7)	93 (26.3)	

Asked questions	True n (%)	False n (%)	I do not know n (%)
<b>Loss of the sense of smell and taste</b>	250(70.8)	103(29.2)	
Right now, we do not have a sufficient cure for the coronavirus; however, early treatment for symptoms and provided supportive treatment can be effective for the majority of patients to recover from their infection.	308(87.3)	29(8.2)	16(4.5)
The severity of coronavirus cases varies individually. For example, not all cases will be in severe form; old age, chronic diseases, and who are obese are considered more likely to have a severe infection.	276(78.2)	66(18.7)	11(3.1)
Eat or getting in touch with wild animals may lead to getting infected with Coronavirus	150 (42.5)	123 (34.8)	80 (22.7)
Patients infected with coronavirus cannot spread this virus to each other as they are not feverish	57 (16.1)	269 (76.2)	27 (7.6)
Coronavirus is transmitted through respiratory droplets of patients who get infected with this virus.	325 (92.1)	22 (6.2)	6 (1.7)
Wearing surgical face masks can protect against getting infected with the coronavirus	292 (82.7)	44 (12.5)	17 (4.8)
Children and young adults do not need to use preventive measures against coronavirus	76 (21.5)	268 (75.9)	9 (2.5)
To prevent coronavirus infection, people must avert in crowded locations, e.g., public parks, and try to avoid public transportation.	317 (89.8)	29 (8.2)	7 (2)
Isolate and providing needed care for people infected with the coronavirus is an efficient step to lessen the virus's spread.	323 (91.5)	20 (5.7)	10 (2.8)
Those who get in touch with COVID-19 virus-infected people have to be done as soon as possible and isolated appropriately, which as a general rule=14 days.	309 (87.5)	29 (8.2)	15 (4.2)

The median knowledge score was 19.0 with an IQR of 18.0-21.0, the mean knowledge score was 19.1 with SD (2.98%), and the general knowledge score was 25. The median score for the 49 percent of participants (n = 173) was 19, and they were deemed to have sufficient knowledge. Of the participants, 76.8% acknowledged that the influenza virus differed from COVID-19. When the respondents were asked whether COVID-19-positive people showed no symptoms, 88.7% of respondents correctly answered. Of the group, 63.5% agreed that the incubation period for the virus was 1–14 days. Regarding the clinical symptomatology of COVID-19, the respondents agreed on: fever (96.9%), headache (85.8%), fatigue (70%), sore throat (57.8%), dry cough (81.3%), diarrhea (58.1%), breathing difficulty (73.7%) and loss of sense of smell and taste (70.8%). Other

symptoms patients experience include less reported myalgia (muscle pain) (48.2%), a runny nose (19.5%), and sneezing (16.7%).

Most (87.3%) respondents correctly agreed that 'there is no sufficient cure for COVID-19'; however, they thought supportive and symptomatic care plans in the early stages could help most infected people recover from the virus. Furthermore, 78.2% correctly agreed that "not all coronavirus-infected people will be in a severe state"; however, they thought that older people with comorbidities and/or Obesity increase the risk of developing a severe form of the disease process. Furthermore, nurses' knowledge of 'dealing with or eating outdoors, or whether living animals can result in infection with coronavirus' showed response variation in response. 42.5% agreed incorrectly, 34.8% did not agree, and 22.7% did not know.

Seventy-six percent of the respondents did not agree correctly that ‘infected people with COVID-19 cannot transmit the infection to other people if there is no fever present’, and 92.1% believed correctly that ‘coronavirus can be transmitted via respiratory droplets of sick individuals. 82.7% of nurses agree that ‘commitment to surgical masks can avoid infection of people with COVID-19’, and 75.9% reported that “children and young adults taking preventive steps against COVID-19 infection is unnecessary”.

To avoid coronavirus infection, people should avoid crowded sites and use public transportation, to which 89.8% of the study nurses correctly agreed. Regarding the point that ‘use of isolation and offering needed health care to infected patients with coronavirus are considered effective steps to decrease the virus transmission process,’ 91.5%

of nurses were in agreement, and 87.5% of nurses properly responded to the statement ‘if the person he/she dealt with had coronavirus, proper isolation is urgently recommended,’ knowing that the observation period is usually 14 days.

The Mann-Whitney U and Kruskal-Wallis tests were adopted to analyze the association between socio-demographic elements and knowledge in Table 3. According to this, Both male and female nurses had the same median knowledge score (19) and insignificant ( $p = 0.740$ ). The median level of knowledge between ages  $< 25$  and  $30-35$  years was 20, ages  $25$  to  $30$  were 19, and  $> 35$  years were 21; findings were also not statistically significant ( $p = 0.022$ ). There was no relation between the place of work, the highest level of education, or the level of knowledge, with  $p$  values of 0.522 and 0.305, respectively.

**Table (3):** Demographics associated with nurses' knowledge regarding the Coronavirus outbreak.

Variable	Number (%)	Median [ Q1- Q3]	P value
<b>Sex</b>			
Male	195 (55.2)	19 [18 - 21]	0.740
Female	158 (44.8)	19 [17 - 21]	
<b>Age</b>			
$\leq 25$	153 (43.3)	20 [18 - 21]	0.022
$> 25-30$	115 (32.6)	19 [17 - 22]	
$> 30-35$	56 (15.9)	20 [18 - 21]	
$> 35$	29 (8.2)	21 [18 - 21]	
<b>Experience</b>			
$< 2$	117 (33.1)	19 [18 - 21]	0.159
$< 2-5$	103 (29.2)	19 [17 - 22]	
$< 5-10$	89 (25.2)	19 [17 - 20]	
$< 10$	44 (12.5)	20 [18 - 22]	
<b>Place of work</b>			
Government Hospital	153(43.3)	19 [17 - 21]	0.522
Private Hospital	167 (47.3)	20 [18 - 21]	
primary health care	26 (7.4)	20 [18 - 21]	
UNRWA Hospital	7 (2)	19 [18 - 22]	
<b>Qualification</b>			
PhD	6 (1.7)	20 [19 - 22]	0.305
Master in Nursing	74 (21)	19 [17 - 21]	
Registered nurse	209 (59.2)	20 [18 - 21]	
Practical nurse	55 (15.6)	19 [17 - 22]	
Aid nurse	9 (2.5)	19 [18 - 22]	

### Attitude

The attitude toward COVID-19 was assessed using six questions, and a numerical value was given for each question, where one

= “strongly disagree,” two = “disagree,” three = “not sure,” four = “agree” and five = “strongly agree” (Table 4).

**Table (4):** Nurses' attitude to corona virus outbreak.

Question	Strongly Disagree n (%)	Disagree n (%)	Not sure n (%)	Agree n (%)	Strongly agree n (%)
By wearing a well-fit face mask is efficient for corona virus prevention	38 (10.8)	19 (5.4)	34 (9.6)	133 (37.7)	129 (36.5)
Frequent hand washing can provide a protection against corona virus	19 (5.4)	23 (6.5)	41 (11.6)	144 (40.8)	126 (35.7)
"I'm assuredly capable of being involved in the care of people showing the picture of coronavirus"	18 (5.1)	27 (7.6)	89 (25.2)	131 (37.1)	88 (24.9)
Palestinian hospitals can deal with coronavirus cases appropriately.	61 (17.3)	71 (20.1)	105 (29.7)	75 (21.2)	41 (11.6)
How frequently do you touch your face?	<b>Always n (%)</b>	<b>Rarely n (%)</b>	<b>Sometimes n (%)</b>		
	105 (29.7)	145 (41.1)	103 (29.2)		
What is the appropriate hand washing time to get rid of this virus?	<b>&lt; 20 seconds</b>	<b>20 seconds - 1 minute</b>	<b>"I do not have an idea"</b>		
	33 (9.3)	293 (83)	27 (7.6)		

The range of the median attitude score, from 16.0 to 21.0, was 18.0, while the mean attitude score was 18.3 (SD = 3.7). The overall attitude score was 26. Table 5 displays the responses to each attitude question in terms of their distribution, showing that 37.7% agreed

and 36.5% strongly agreed that wearing a well-fitting face mask was considered sufficient to prevent COVID-19, and 40.8% agreed, 35.7% strongly agreed that hand washing breaks the infection cycle and may prevent COVID-19.

**Table (5)** Demographics associated with nurses' attitude to coronavirus outbreaks.

Variable	Number (%)	Median [ Q1- Q3]	P value
<b>Sex</b>			
Male	195 (55.2)	18 [16 - 21]	0.210
Female	158 (44.8)	19 [16 - 21]	
<b>Age (year)</b>			
≤25	153 (43.3)	18 [16 - 20]	<b>0.005</b>
>25-30	115 (32.6)	19 [16 - 21]	
>30-35	56 (15.9)	20 [17- 23]	
>35	29 (8.2)	20 [17 - 22]	
<b>Experience</b>			
< 2	117 (33.1)	18 [16 - 19]	<b>0.002</b>
< 2-5	103 (29.2)	19 [16 - 21]	
< 5-10	89 (25.2)	20 [17- 23]	
< 10	44 (12.5)	20 [16 - 22]	
<b>Place of work</b>			
Government Hospital	153(43.3)	19 [16 - 21]	<b>0.030</b>
Private Hospital	167 (47.3)	18 [16 - 21]	



Variable	Number (%)	Median [ Q1- Q3]	P value
primary health care	26 (7.4)	20 [16 - 24]	
UNRWA Hospital	7 (2)	23 [17 - 24]	
<b>Qualification</b>			
PhD	6 (1.7)	16.5 [16 - 19]	0.305
Master in Nursing	74 (21)	18 [14 - 21]	
Registered nurse	209 (59.2)	19 [16 - 21]	
Practical nurse	55 (15.6)	19 [17 - 22]	
Aid nurse	9 (2.5)	17 [14 - 19]	

Eighty-three percent of the participating nurses agreed that the policy of ‘washing hands for 20 to one min could help kill the virus’. However, 37.1% agreed, and 24.9% strongly agreed that ‘they are confidently capable of participating in the care of infected people who have signs and symptoms of COVID-19.’ On the contrary, 25.2% were unsure they could participate in treating infected patients. When asked how often they touched their faces, 41.1% reported ‘rarely,’ 29.7% reported “always,” and 29.2% reported ‘sometimes.’

When asked about the readiness of Palestine to contain COVID-19, up to 29.7% ( $n = 105$ ) were not sure, and 21.2% ( $n = 75$ ) acknowledged that “the Palestinian states may have the ability to handle the coronavirus pandemic.” However, 20.1% ( $n = 71$ ) of the respondents disagreed, stating that the Palestinian state cannot handle the COVID-19 pandemic appropriately.

Table 5 shows the attitudes' evidence and correlation with two demographic factors, age and experience. Nurses' attitude was enhanced as age and experience increased ( $p < 0.05$ ). In comparison, gender, work location, and educational level did not correlate significantly with attitude. When the level of education was lower, the attitude was shown to improve, with median scores of Ph.D. and Master's degrees in nursing of 16.5 and 18, respectively. In contrast, registered and licensed practical nurses scored 19, illustrating that persons with higher degrees had less exposure to an area with the virus and less contact with patients. These data did not show significance ( $p = 0.305$ ).

#### Practices

The preventive steps for COVID-19 were assessed using six questions, each including five criteria and a numerical value (1 = always, 2 = often, 3 = occasionally, and 4 = never) (Table 6).

**Table (6):** Nurses' practices during a coronavirus outbreak.

Question	Always n (%)	Often n (%)	Occasional n (%)	Never n (%)
During the latter days, "I have gone populous locations?"	60 (17)	133 (37.7)	90 (25.5)	70 (19.8)
During the latter days, I used to wear face masks when dealing with clients.	259 (73.4)	69 (19.5)	21 (5.9)	4 (1.1)
During the latter days, I used to abstain from shaking hands.	158 (44.8)	118 (33.4)	47(13.3)	30 (8.5)
During the latter days, I used to wash my hands before and after dealing with each client.	261 (73.9)	68 (19.3)	21 (5.9)	3 (0.8)
In the latter days, I was averted people who showed signs & symptoms indicative of coronavirus	190 (53.8)	106 (30)	24 (6.8)	33 (9.3)

When dealing with coronavirus-infected persons, I apply all needed personal protective equipment, including a face mask, hand gloving, and gowning.	281 (79.6)	59 (16.7)	11 (3.1)	2 (0.6)
---	------------	-----------	----------	---------

As shown in Table 7, the existing relationship between socio-demographic and preventive practices was not statistically significant, with *p*-values of 0.938, 0.406, 0.801, 0.043, and 0.562, respectively.

The general practice score was 24, with a mean practice score of 9.9 (SD = 2.4) and a median of 9.0 with an IQR of 8.0–11.0. Of the respondents, 133 (37.7%) nurses would have gone to any crowded place. However, 90 (25.5%) nurses reported occasionally, 60 (17%) always reported, and 70 nurses (19.8%) never went to crowded places. Most respondents (73.4%) committed to wearing face masks when dealing with patients. However, approximately 44.8% always refused to shake hands, and 33.4% often refrained. Most (73.9%) respondents committed to hand washing before handling the patients and afterward. Additionally, more than 50% of the

study nurses averted patients showing suggestive signs and/or reported symptoms of COVID-19 (53.8% and 30%, respectively). Approximately 79.6% of the equipment respondents wore all the needed for self-protection (i.e., [PPE]), like face masks, gowns, and gloves when in touch with COVID-19-infected patients.

Table 7 results revealed no significant relationship between sociodemographics and practices against COVID-19. However, female nurses exhibited higher practice than male nurses (medians = 9.5 and 9, respectively). Respondents < 25 years (median =10) and those > 25 years (median =9) of age have shown differences that are not statically significant. However, government hospitals exhibited better practice than other hospitals (median =10).

**Table (7):** Demographics associated with nursing providers' preventive practices against coronavirus outbreak.

Variable	Number (%)	Median [ Q1- Q3]	P value
<b>Sex</b>			
Male	195 (55.2)	9 [8 - 12]	0.938
Female	158 (44.8)	9.5 [8 - 11]	
<b>Age</b>			
≤25	153 (43.3)	10 [9 - 11]	0.406
>25-30	115 (32.6)	9 [8 - 11]	
>30-35	56 (15.9)	9 [8 - 12]	
>35	29 (8.2)	9 [8 - 11]	
<b>Experience</b>			
< 2	117 (33.1)	10 [9 - 11]	0.801
< 2-5	103 (29.2)	9 [8 - 11]	
< 5-10	89 (25.2)	9 [8 - 12]	
< 10	44 (12.5)	9 [8 - 11]	
<b>Place of work</b>			
Government Hospital	153(43.3)	10 [8 - 12]	<b>0.043</b>
Private Hospital	167 (47.3)	9 [9 - 11]	
Primary health care	26 (7.4)	9 [8 - 11]	
UNRWA Hospital	7 (2)	8 [7 - 8]	
<b>Qualification</b>			
PhD	6 (1.7)	9.5 [8 - 12]	0.562
Master in Nursing	74 (21)	10 [9 - 13]	
Registered nurse	209 (59.2)	9 [8 - 11]	
Practical nurse	55 (15.6)	10 [8 - 11]	

Variable	Number (%)	Median [ Q1- Q3]	P value
Aid nurse	9 (2.5)	9 [8 - 12]	

The Kolmogorov-Smirnov test revealed that the KAP values were not distributed normally for the questionnaire. Instead, the correlation between its different sections was evaluated. Therefore, the KAP scores and the correlation values revealed a positive correlation between the calculations of the KAP score performed using Spearman's rank correlation ( $r$ ), As shown in table 8.

**Table (8):** Correlations among KAP.

Variable	rs	P-value
The knowledge and attitude	0.205	< 0.001*
The knowledge and practice	- 0.127	< 0.001*
The Practice and Attitude	- 0.202	< 0.001*

\*  $p < 0.05$  considered to have Statistical significance.

## DISCUSSION

The current research was constructed to assess and assess the knowledge level, attitudes, and practice nurses in Palestine have toward COVID-19. However, it is worth mentioning that no studies have been conducted to study and evaluate nurses' knowledge, attitudes, and practices regarding COVID-19 in the Palestinian state.

COVID-19 was considered a virus in speed and dynamic change, placing universal health at a challenge that influences all sides [28, 29]. Nurses are the first line in the COVID-19 fight. Since this virus can directly and/or indirectly affect them, they are more likely to acquire this infection than others [30]. Therefore, nurses must gain adequate awareness and understanding of this disease process, including signs and symptoms, diagnostic and treatment measures, and preventive precautions.

Our study found inconsistent with the plantain study, which revealed that most participants had a high level of knowledge[31]. Another study in Palestine, in line with our study, found an acceptable level of knowledge among Palestinian pharmacists regarding

COVID-19.[32]. Along the same line, a Jordanian study revealed that the average correct score of COVID-19 knowledge was 84%. [33] Also, this research revealed that nurses have adequate knowledge about COVID-19, with 60% of the respondents having good knowledge about the disease, including 131 men and 102 females. These results are consistent with the study conducted in Iran in 2020 by Nemati et al. [34], as well as the studies by Asaad [35] and Olum [36]. Furthermore, the results of this current research on the appropriateness of nurses' knowledge regarding coronavirus were homogeneous with the study in Pakistan [37] and performed by Huynh [38]. In this survey, we also agreed with the findings of Tamang [39]. However, our finding that 60% of nurses had sufficient knowledge was much less than the Chinese study by Zhang et al. [10], which revealed that 89% of healthcare workers had adequate knowledge of dealing with the virus. Furthermore, Bhagavathula et al. have shown insufficient knowledge about COVID-19 [40].

In this study, we reveal that the participating nurses gained their information from official international health organizational sites and media (65.4%, e.g., WHO, CDC), followed by official government websites and media (52.4%; e.g., MOH), then social media (46.5%), news media (38.2%; e.g., TVs, radio, magazines, newspapers), and the last source, journals (24.1%). On the contrary, Huynh reported that healthcare workers were more attracted to social media to obtain information about upcoming infectious diseases, including COVID-19, and found less use for the official MOH website at present [38]. However, in our study, half of the nurses obtained their information from official government websites and media, indicating the variety of channels on the MOH website to enhance knowledge. This had positive implications for improving nursing knowledge levels consistent with Bhagavathula et al. and inconsistent with Huynh [38, 40]. Furthermore, in a study of nursing students, most relied on formal news reports from the Palestinian state as information, reflecting the population's attention, including nurses, in

association with official government sites and media (e.g., MOH) [24].

Our study showed a positive attitude in the vast majority of participants, as approximately 36.5% ‘strongly agreed’ and “agreed” that using conventional surgical masks as a kind of protection against COVID-19 was thought to be sufficient, similar to the data of Ng et al., in which sufficient safety was achieved with hand washing [41]. Approximately 37.1% strongly agreed, and 24.9% agreed with the nurses in this current study that they “may be able to participate in the medical treatment of persons infected with COVID-19 with confidence, which indicates that providing sufficient information on how to care for patients with COVID-19 should be made available for these nurses, which was a finding consistent with the study by Olum [36]. However, when asked about the readiness of Palestinian hospitals to deal with COVID-19 cases, 20.1% disagreed and 17.3% strongly disagreed, and most nurses confidently participated in the care of patients with COVID-19.

Demographic and work-related variables were found to have statistical weight during the current research. Female nurses performed better in terms of prevention than male nurses. This difference may be associated with ‘in Palestine, women are more willing to work in the health care field than men [42]. These data were correlated with a United Nations policy brief demonstrating that women are more confident and self-aware than males in dealing with COVID-19 [43].

The age of nurses had a significant impact on taking preventive precautions and perceptions of those with COVID-19. In the current research, participating nurses aged > 25 years of age, compared to newly employed nurses, scored significantly statistically higher in the attitude category about COVID-19, stating that experienced nurses who work in hospitals were exposed and stayed longer in a position, compared to a newly employed nurse in the same situation, which was considered related to isolation. This was consistent with the findings of Gao [44], who reported that a nurse with shift system experience in isolation departments could provide helpful information to manage shift patterns. Therefore, for those

who work in the nursing management and supervisory domain, it is advisable to schedule the time of nurse duties wisely, allocate nursing personnel accordingly, and create an emergency plan on standby for any possible crisis.

Our study showed that nurses have good prevention practices against coronavirus, which was correlated with the revelation by Alfahan et al. regarding COVID-19 [45] and the general Chinese population with the disease [19]. Most nurses adhered to infection control and preventive measures as approved by the MOH and WHO; these measures involved frequent hand washing, ensuring social distancing, and wearing face masks in areas and cases. Most nurses reported using a mask when speaking to patients and washing their hands before and after treating patients. Those actions were crucial to avoid possible patient-patient and patient-nurse transmission of coronavirus. However, 53.8% of nurses always and 30% often avert those with signs of COVID-19. This may be due to the shortfall of PPE, which has become a universal issue [46-48].

## LIMITATIONS AND RECOMMENDATIONS

In this research, we had some limitations. One was the lack of a tool that had previously been standardized and validated for assessing KAPs in COVID-19. However, we modified a previous tool that evaluated KAP among Chinese residents regarding respiratory tract infections [19, 25]. Furthermore, the study questionnaire was created using WHO and CDC’s reports and guidelines for COVID-19 [49]. However, in Palestine, our study was one of the first to evaluate the KAP of nurses, which can later be used to improve the KAP of nurses to COVID-19 through focused educational and training programs.

Another limitation; First, this study used a cross-sectional design in which nurses were evaluated once during a predetermined period. Second, the data were collected by online questionnaire; therefore, in context, the respondents may react in a way that makes them seem knowledgeable, but it does not provide the actual answers. Finally, as mentioned ear-

lier, convenience sampling's primary limitation is that the sample bias makes the study's findings difficult to generalize.

We recommend the researcher for further research with more sample size and re-check the information after a period of the pandemic is finished, as the information about COVID-19 is still up to date. Considering the above-mentioned limitations, future studies should be conducted to evaluate nurses' knowledge, practices, and attitudes toward COVID-19.

## CONCLUSIONS

This study showed sufficient knowledge with a positive attitude with significance to nurses of the female sex, who had greater preventive behavior than male nurses, and the age of nurses. These factors significantly impacted the perceptive and preventive domains of COVID-19. Nurses also showed good prevention practices against the coronavirus. Despite that, this study showed an inadequacy in nurses' awareness of some vital attitudes and prevention steps; however, this did not show statistical significance. Educational health courses and programs focused on promoting the range of existing attitudes and practices against the coronavirus are advised.

### *Ethics Approval*

The Institutional Review Board (IRB) of An-Najah National University approved the study.

Consent forms were obtained from the participants prior to participation.

### *Consent for publication*

Not applicable.

### *Data Availability*

The corresponding author may be contacted for all materials and data obtained from this study.

### *Contributions*

**EMS:** Literature review, draft revision, submission, and corresponding author. **AMS:** Literature review, draft revision, and manuscript preparation; **LZ:** Literature review, preparation of the manuscript. **EMS** and **AMS** initiated, conceptualized, designed, and organized the research; supervised and critically reviewed the manuscript; and finalized the

manuscript. The final manuscript was reviewed and approved by all authors.

### *Conflict of interest*

The authors have no conflicts of interest to disclose.

## FUNDING

The authors received no financial support for this article's research, authorship, and/or publication.

## ACKNOWLEDGMENTS

The authors thank the Clinical Research Center of An-Najah National University Hospital for their wise advice.

## REFERENCES

- 1] Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, Zhao X, Huang B, Shi W, Lu R, Niu P, Zhan F, Ma X, Wang D, Xu W, Wu G, Gao GF, Tan W, China Novel Coronavirus I, Research T. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med.* 2020; 382(8): 727-33.
- 2] World Health Organisation. Pneumonia of unknown cause – China: WHO; 2020 [cited 2021 April 21]. Available from: <https://www.who.int/csr/don/05-january-2020-pneumonia-of-unkown-cause-china/en/>.
- 3] World Health Organisation. WHO Director-General's statement on IHR Emergency Committee on Novel Coronavirus (2019-nCoV) 2020 [cited 2021 April 21]. Available from: [https://www.who.int/director-general/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-\(2019-ncov\)](https://www.who.int/director-general/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov)).
- 4] World Health Organisation. WHO Director-General's opening remarks at the media briefing on COVID-19 - March 27 2020 2020 [cited 2021 April 21]. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---27-march-2020>.

- 5] Anadolu Agency. Palestine confirms 7 coronavirus cases in Bethlehem 2020 [cited 2021 March 12]. Available from: <https://web.archive.org/web/20200406111548/https://www.aa.com.tr/en/middle-east/palestine-confirms-7-coronavirus-cases-in-bethlehem-/1756291>.
- 6] Palestinian Ministry of Health. CORONAVIRUS - COVID19 Surveillance System 2020 [cited 2021 April 21]. Available from: <http://site.moh.ps/index/covid19/LanguageVersion/0/Language/ar>.
- 7] World Health Organisation. COVID-19: Occupational health and safety for health workers 2020 [cited 2021 April 22]. Available from: <https://www.who.int/publications/i/item/WHO-2019-nCoV-HCW-advice-2021.1>.
- 8] Gan WH, Lim JW, Koh D. Preventing Intra-hospital Infection and Transmission of Coronavirus Disease 2019 in Healthcare Workers. *Saf Health Work*. 2020;11(2):241-3.
- 9] Wang D, Hu B, Hu C, Zhu F, Liu X, Zhang J, Wang B, Xiang H, Cheng Z, Xiong Y, Zhao Y, Li Y, Wang X, Peng Z. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China. *JAMA*. 2020;323(11):1061-9.
- 10] Zhang M, Zhou M, Tang F, Wang Y, Nie H, Zhang L, You G. Knowledge, attitude, and practice regarding COVID-19 among healthcare workers in Henan, China. *J Hosp Infect*. 2020;105(2):183-7.
- 11] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, Qiu Y, Wang J, Liu Y, Wei Y, Xia J, Yu T, Zhang X, Zhang L. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet*. 2020;395(10223): 507-13.
- 12] CDC Covid- Response Team. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19) - United States, February 12-March 16, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(12):343-6.
- 13] Escalera-Antezana JP, Lizon-Ferrufino NF, Maldonado-Alanoca A, Alarcon-De-la-Vega G, Alvarado-Arnez LE, Balderrama-Saavedra MA, Bonilla-Aldana DK, Rodriguez-Morales AJ, Lancovid. Clinical features of the first cases and a cluster of Coronavirus Disease 2019 (COVID-19) in Bolivia imported from Italy and Spain. *Travel Med Infect Dis*. 2020;35:101653.
- 14] Shawahna R. Knowledge, attitude, and use of protective measures against COVID-19 among nurses: a questionnaire-based multicenter cross-sectional study. *BMC Nursing*. 2021;20(1):163.
- 15] Tadesse DB, Gebrewahd GT, Demoz GT. Knowledge, attitude, practice and psychological response toward COVID-19 among nurses during the COVID-19 outbreak in northern Ethiopia, 2020. *New Microbes New Infect*. 2020;38:100787.
- 16] Tang L, Bie B, Park SE, Zhi D. Social media and outbreaks of emerging infectious diseases: A systematic review of literature. *Am J Infect Control*. 2018;46(9):962-72.
- 17] Ishii H, Shimatsu A, Okimura Y, Tanaka T, Hizuka N, Kaji H, Hanew K, Oki Y, Yamashiro S, Takano K, Chihara K. Development and validation of a new questionnaire assessing quality of life in adults with hypopituitarism: Adult Hypopituitarism Questionnaire (AHQ). *PLoS One*. 2012;7(9):e44304.
- 18] Arora C, Sinha B, Malhotra A, Ranjan P. Development and Validation of Health Education Tools and Evaluation Questionnaires for Improving Patient Care in Lifestyle Related Diseases. *J Clin Diagn Res*. 2017;11(5):JE06-JE9.
- 19] Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT, Li Y. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. *Int J Biol Sci*. 2020;16(10):1745-52.

- 20] Mbroh LA. Assessing Knowledge, Attitude and Practices of Hand Hygiene among University Students. Mankato, MN, USA: Minnesota State University; 2019.
- 21] Lau JT, Yang X, Tsui H, Kim JH. Monitoring community responses to the SARS epidemic in Hong Kong: from day 10 to day 62. *J Epidemiol Community Health*. 2003; 57(11): 864-70.
- 22] Bener A, Al-Khal A. Knowledge, attitude and practice towards SARS. *J R Soc Promot Health*. 2004;124(4):167-70.
- 23] Kim CJ, Choi WS, Jung Y, Kiem S, Seol HY, Woo HJ, Choi YH, Son JS, Kim KH, Kim YS, Kim ES, Park SH, Yoon JH, Choi SM, Lee H, Oh WS, Choi SY, Kim NJ, Choi JP, Park SY, Kim J, Jeong SJ, Lee KS, Jang HC, Rhee JY, Kim BN, Bang JH, Lee JH, Park S, Kim HY, Choi JK, Wi YM, Choi HJ. Surveillance of the Middle East respiratory syndrome (MERS) coronavirus (CoV) infection in healthcare workers after contact with confirmed MERS patients: incidence and risk factors of MERS-CoV seropositivity. *Clin Microbiol Infect*. 2016;22(10):880-6.
- 24] Naseef HA, Al-Shami Nm, Hadba LSA, Humos LA, Shaheen RN, Mitwasi TT, Khairy LE. Knowledge, attitudes and practices about Coronavirus disease (COVID-19) among Birzeit University students: A cross-sectional study 2020 [updated 2021/02/15; cited 2021 May 22]. Available from: <https://doi.org/10.21203/rs.3.rs-83268/v1>.
- 25] Goni MD, Naing NN, Hasan H, Wan-Arfah N, Deris ZZ, Arifin WN, Hussin T, Abdulrahman AS, Baaba AA, Arshad MR. Development and validation of knowledge, attitude and practice questionnaire for prevention of respiratory tract infections among Malaysian Hajj pilgrims. *BMC Public Health*. 2020;20(1):189.
- 26] Barham A, Ibraheem R, Zyoud SH. Cardiac self-efficacy and quality of life in patients with coronary heart disease: a cross-sectional study from Palestine. *BMC Cardiovasc Disord*. 2019; 19(1): 290.
- 27] Sweity EM, Salahat AM, Sada Aa, Aswad A, Zabin LM, Zyoud SeH. Knowledge, attitude, practice and perceived barriers of nurses working in intensive care unit on pain management of critically ill patients: a cross-sectional study. *BMC Nursing*. 2022;21(1):202.
- 28] Kassema JJ. COVID-19 Outbreak: Is It a Health Crisis or Economic Crisis or Both? Case of African Counties. *SSRN Electronic Journal*. 2020: 10.2139/ssrn.3559200.
- 29] McKibbin WJ, Fernando R. The Global Macroeconomic Impacts of COVID-19: Seven Scenarios. *SSRN Electronic Journal*. 2020:10.2139/ssrn.3547729.
- 30] MedScape. In Memoriam: Healthcare Workers Who Have Died of COVID-19 2020 [cited 2021 April 22]. Available from: [www.medscape.com/viewarticle/927976](http://www.medscape.com/viewarticle/927976)
- 31] Ayed A, Zabn K. Knowledge and Attitude Towards COVID-19 Among Nursing Students: Palestinian Perspective. *SAGE Open Nursing*. 2021; 7: 23779608211015150.
- 32] Koni A, Taha S, Daifallah A, Koni M, Abutaha S, Sabateen A, Zyoud SeH. A cross-sectional evaluation of knowledge, attitudes, practices, and perceived challenges among Palestinian pharmacists regarding COVID-19. *SAGE Open Medicine*. 2022; 10: 20503121211069278.
- 33] Al-Hussami M, El-Hneiti M, Bani Salameh A, Abu Sharour L, Al-Hussami R. Knowledge, Attitudes, and Behavior Toward COVID-19 Among Jordanian Residents During the Quarantine Period of the COVID-19 Pandemic: A National Survey. *Disaster Medicine and Public Health Preparedness*. 2022;16(4):1438-46.
- 34] Nemati M, Ebrahimi B, Nemati F. Assessment of Iranian Nurses' Knowledge and Anxiety Toward COVID-19 During the Current Outbreak in Iran. *Arch Clin Infect Dis*. 2020; 15(COVID-19): e102848.

- 35] Asaad A, El-Sokkary R, Alzamanan M, El-Shafei M. Knowledge and attitudes towards Middle East respiratory syndrome-coronavirus (MERS-CoV) among health care workers in south-western Saudi Arabia. *East Mediterr Health J.* 2020; 26(4): 435-42.
- 36] Olum R, Chekwech G, Wekha G, Nassozi DR, Bongomin F. Coronavirus Disease-2019: Knowledge, Attitude, and Practices of Health Care Workers at Makerere University Teaching Hospitals, Uganda. *Front Public Health.* 2020;8:181.
- 37] Khan S, Khan M, Maqsood K, Hussain T, Noor Ul H, Zeeshan M. Is Pakistan prepared for the COVID-19 epidemic? A questionnaire-based survey. *J Med Virol.* 2020;92(7):824-32.
- 38] Huynh G, Nguyen TH, Tran V, Vo K, Vo V, Pham L. Knowledge and attitude toward COVID-19 among healthcare workers at District 2 Hospital, Ho Chi Minh City. *Asian Pac J Trop Dis.* 2020; 13(6): 260-5.
- 39] Tamang N, Rai P, Dhungana S, Sherchan B, Shah B, Pyakurel P, Rai S. COVID-19: a National Survey on perceived level of knowledge, attitude and practice among frontline healthcare Workers in Nepal. *BMC Public Health.* 2020; 20(1): 1905.
- 40] Bhagavathula AS, Aldhalei WA, Rahmani J, Mahabadi MA, Bandari DK. Knowledge and Perceptions of COVID-19 Among Health Care Workers: Cross-Sectional Study. *JMIR Public Health Surveill.* 2020;6(2):e19160.
- 41] Ng K, Poon BH, Kiat Puar TH, Shan Quah JL, Loh WJ, Wong YJ, Tan TY, Raghuram J. COVID-19 and the Risk to Health Care Workers: A Case Report. *Ann Intern Med.* 2020;172(11):766-7.
- 42] Al-Dossary RN. The Saudi Arabian 2030 vision and the nursing profession: the way forward. *Int Nurs Rev.* 2018;65(4):484-90.
- 43] United Nations Women. UN Secretary-General's Policy Brief: The Impact of COVID-19 on Women Digital Library: UN Women 2020 [cited 2021 April]. Available from: <https://www.unwomen.org/en/digital-library/publications/2020/04/policy-brief-the-impact-of-covid-19-on-women>.
- 44] Gao X, Jiang L, Hu Y, Li L, Hou L. Nurses' experiences regarding shift patterns in isolation wards during the COVID-19 pandemic in China: A qualitative study. *J Clin Nurs.* 2020; 29(21-22): 4270-80.
- 45] Alfahan A, Alhabib S, Abdulmajeed I, Rahman S, Bamuhair S. In the era of corona virus: health care professionals' knowledge, attitudes, and practice of hand hygiene in Saudi primary care centers: a cross-sectional study. *J Community Hosp Intern Med Perspect.* 2016;6(4):32151.
- 46] Bauchner H, Fontanarosa PB, Livingston EH. Conserving Supply of Personal Protective Equipment-A Call for Ideas. *JAMA.* 2020;323(19):1911.
- 47] Ranney ML, Griffeth V, Jha AK. Critical Supply Shortages - The Need for Ventilators and Personal Protective Equipment during the Covid-19 Pandemic. *N Engl J Med.* 2020; 382(18): e41.
- 48] World Health Organization. Rational use of personal protective equipment (PPE) for coronavirus disease (COVID-19): interim guidance, March 19 2020: World Health Organization; 2020 [cited 2021 April 21]. Available from: <https://apps.who.int/iris/handle/10665/331498>.
- 49] World Health Organization. Infection prevention and control during health care when novel coronavirus ( nCoV) infection is suspected: interim guidance, January 25 2020 2020 [cited 2021 April 21]. Available from: <https://apps.who.int/iris/handle/10665/330674>.