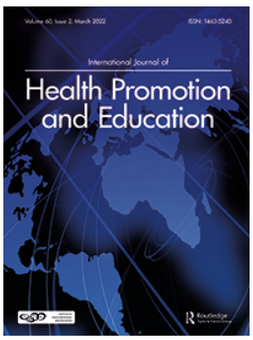

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# COVID-19: knowledge and attitude among nursing students in Iran

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# COVID-19: knowledge and attitude among nursing students in Iran

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**ABSTRACT**

During infectious disease outbreaks, the knowledge and attitudes level of individuals involved in patient care is controversial. This cross-sectional study assessed the levels of knowledge and attitudes of Iranian nursing students regarding COVID-19 to determine their educational needs and take the necessary measures for their readiness. A total of 302 nursing students completed a valid and reliable researcher-made questionnaire through a web-based survey to collect data. 54% were women among the participants, and 51.32% were over 20. The mean (SD = standard deviation) scores of knowledge and attitudes were 17.99 (SD = 5.26) and 3.68 (SD = 1.15), respectively. According to the classification of total knowledge score, the unsatisfactory, satisfactory, and excellent levels were 55.30%, 18.50%, and 26.20%, respectively. The knowledge levels of nursing care for COVID-19 patients, sampling method for diagnostic purposes, medications used during COVID-19 treatment, and the clinical course of COVID-19 were thus lower than other issues. The mean score of attitudes was also 3.68 (SD = 1.15), representing the nursing students' positive attitudes towards caring for COVID-19 patients. The results of the Spearman correlation coefficient between knowledge and attitude about COVID-19 showed a significant positive relationship between the total knowledge and attitude scores ($r = 0.23$, $p < 0.001$). Therefore, given the knowledge levels, particularly the unsatisfactory level in nursing care for COVID-19 patients, and the relatively positive attitudes towards this condition, it is helpful to implement training programs to improve the nursing students' knowledge and clinical skills.

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Attitude; COVID-19; knowledge; nursing students

## Introduction

The rapid spread of the coronavirus disease 2019 (COVID-19) became a leading concern in health care professions (Kamineni et al. 2020). COVID-19 pandemic has led to public health emergency declarations worldwide (Canet-Vélez et al. 2021), and the World Health Organization (WHO) has warned all countries to cooperate to prevent the disease and its

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growing expansion (WHO 2020). In the health care teams, nurses are the critical members of the frontline whose performance largely determines the quality of health care services. Nurses form the largest group of staff in the healthcare profession. Their direct relationship with patients is therefore of particular importance (Lazzarin, Biondi, and Di Mauro 2012). Due to existing nursing shortages in many countries during the COVID-19 pandemic, all nursing students have been requested to declare their agreement to work in hospitals voluntarily (Savitsky et al. 2020). Therefore, nursing students need professional, theoretical, and practical skills to prevent and govern infection during pandemics (Whitfield, MacQuarrie, and Boyle 2020). It is desirable to consider the critical role of knowledge, a positive attitude towards preventive measures, and adherence to behavioral recommendations to combat COVID-19 (Ghaderi and Mahmoodi 2021). Knowledge of diseases leads to shaping attitudes and performance of nurses and directly influences their behavior. In the absence of inadequate knowledge and attitude, the risk of infection increases due to poor performance (Shahabi et al. 2021).

In this sense, the educational needs of nursing students about care during the COVID-19 pandemic are essential because before entering the operational settings, they must be given the necessary training. In addition, the assessment of nursing students' attitudes could be helpful to address their negative attitudes or unwillingness and lack of motivation to cooperate during pandemics.

Some countries reported various percentages of their nursing students' knowledge and attitudes during the COVID-19 pandemic. For example, the knowledge and attitudes levels rates among nursing students in Italy were 95.4% for good knowledge and 91.1% for positive attitudes. However, there were low levels of knowledge in Mexico and high stress and fear among nursing students towards COVID-19 (Medina Fernández et al. 2021; Provenzano et al. 2020).

Regarding the literature review, this study aimed to determine the knowledge and attitudes of Iranian nursing students towards the COVID-19 to provide their educational needs during the pandemics. Also, this study assessed the crucial factors on knowledge and attitudes scores of the study sample.

## Materials and methods

### *Setting and sampling*

This cross-sectional study was conducted on undergraduate nursing students enrolled at Shahid Beheshti University of Medical Sciences, Tehran, Iran, during the COVID-19 pandemic to assess their levels of knowledge and attitudes towards caring for patients with COVID-19. The sample size was selected with the convenience sampling technique. The PORSLINE survey software designed an online questionnaire in Persian (Menon and Muraleedharan 2020; Nulty 2008). The online questionnaire was then shared in the channels and groups of nursing students in Telegram and WhatsApp from January to May 2021. Ultimately, a total number of 302 nursing students completed the questionnaire. Participation in this study was voluntary, and the identification information has not been recorded anywhere on the questionnaire.

### Data collection

This study utilized researcher-made questionnaires based on previous studies (Modi et al. 2020; Taghrir and Borazjani 2020) and preventive instructions and recommendations of the WHO about COVID −19 (WHO 2020). This study questionnaire had three parts of demographics, knowledge, and attitudes. The demographic part was related to the participants' information, including age, gender, academic year, employment status in health care centers, COVID-19 centers, a history of caring for COVID-19 patients, and a history of infection with COVID-19, using Yes/No response formats.

The knowledge part focused on the nursing students' level of knowledge about COVID-19 using 30 questions in the form of 10 domains. Ten domains were as follows: transmission, preventive and protective measures against droplet transmission, clinical presentations and diagnostic symptoms, vulnerable people in times of COVID-19, the clinical course of the disease, knowledge to treat COVID-19 patients, hypoxia and oxygen therapy for COVID-19, nursing care for COVID-19 patients, observation and monitoring of patients with COVID-19 suspected, the sampling of patients with COVID-19 suspected. Each domain had three items. The responses to the items were in the form of agree, disagree, and I do not know. Point 1 belonged to the correct answer, and point zero belonged to the incorrect or I do not know. The total knowledge score ranged from 0 to 30. Based on previous similar studies, we classified the total knowledge score as excellent ($\geq 75^{th}$ percentile, 22–27), satisfactory ($50^{th}$-$75^{th}$ percentile, 20–21), and unsatisfactory ($\leq 50^{th}$ percentile, 0–19) (Al-Rawajfah et al. 2021; Taghrir and Borazjani 2020).

The attitudes part assessed the nursing students' attitudes towards COVID-19, the willingness to care for patients during the COVID-19 crisis, and their motivation to raise information about the virus. This part included five items with the form of Yes/No. The total score of attitude varied between 0–5.

In the present study, the face and content validity of the questionnaire was confirmed by ten healthcare practitioners and academics. The Cronbach's alpha for attitudes was 0.73. The knowledge questionnaire's Kuder-Richardson 20 (KR-20) reliability coefficient was 0.82.

### Statistical analysis

The software SPSS (version 22) and Excel (version 2013, Microsoft) were used for statistical analysis and calculating the Kuder-Richardson 20 reliability, respectively. Kolmogorov–Smirnov test was used to assess the normality of data. There were no missing data. Descriptive statistics, including mean (SD) and median [min, max] for continuous variables, and frequency (percentage) for categorical variables, were used for characteristics of the nursing students. The age variable was classified (students≤ 20, >20 years old) due to previous similar studies and because most students over the age of 20 enter the workplaces (Honarvar et al. 2020; Kumar et al. 2021; Nemati, Ebrahimi, and Nemati 2020). Mann–Whitney U test and Kruskal–Wallis test compared mean total knowledge and attitude between different variables. We used the ordinal logistic regression model (Univariate and multivariate) to assess the potential associations of independent variables with knowledge score levels (dependent variable). The independent variables included age, gender, academic level, work experience in medical centers,

work experience in COVID-19 centers, and infection with coronavirus. All significant independent variables in the Univariate ordinal regression model were entered into the multivariate model to determine the most influential factors. The Spearman correlation coefficient was used to evaluate the possible association between the total knowledge and attitude scores. The statistical significance level was set at P-value<0.05.

### Ethical considerations

The permission was obtained before the study through the Clinical Research Development Unit of Loghman Hakim Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran (Ethics Code: IR.SBMU.RETECH.REC.1399.496; research proposal code:24674). The study's objectives were explained at the beginning of the questionnaire, and completing the questionnaire was considered informed consent to participate in the study.

## Results

### Characteristics of nursing students

A total of 302 nursing students have participated in this study. The mean (SD) score, minimum, maximum, and median of nursing students' age were 20.74 (1.77), 18, 27, and 21 years, respectively. While 51.32% (n = 155) of them were older than 20 years old, 48.67% (n = 147) were in the group of ≤ 20 years old. The rate of female nursing students was 54% (n = 163). 32.8% (n = 99) and 31.50% (n = 95) of the participants were in the second year and third-year of academic level. Most of the students did not work in medical centers (n = 241, 79.80%). 8.60 % (n = 26) of them had work experience in COVID-19 centers. 66.60% (n = 201) of them were not infected with COVID-19 (Table 1).

### Comparison of total knowledge and attitude scores across different variables

Table 1 compares total knowledge and attitude scores among different characteristics of nursing students. The results showed that older nursing students (> 20 years) reported a higher mean score of knowledge than students ≤ 20 years old [18.70 (SD = 5.53) vs. 17.24 (SD = 4.85), p = 0.001]. There was a significant difference between students' academic levels (p < 0.001). The mean score of knowledge in fourth (19.20 (SD = 5.31)) and third-year (18.88 (SD = 5.10)) nursing students was higher than second (17 (SD = 5.16)) and first-year (15.76 (SD = 4.89)) students. The mean score of knowledge was more increased in nursing students with work experience in medical centers than those without work experience [19.11 (SD = 5.67) vs. 17.71 (SD = 5.12), p = 0.004]. Furthermore, the mean score of knowledge was higher in nursing students with work experience in COVID-19 centers than students without work experience [21.10 (SD = 3.62) vs. 17.70 (SD = 5.30), p < 0.001]. The results about COVID-19 attitude showed that the mean score of attitude in nursing students with work experience in COVID-19 centers was significantly higher than students without work experience [4.23 (SD = 0.86) vs. 3.63 (SD = 1.17), p = 0.01; Table 1).

**Table 1.** The comparison of knowledge and attitude scores between levels of characteristics (N = 302).

| Characteristics | | values | KnowledgeMean (SD) | P-value [a] | AttitudeMean (SD) | P-value [a] |
|---|---|---|---|---|---|---|
| Age (year) | | | | | | |
| Mean (SD) | | 20.74 (1.77) | | | | |
| Median [min,max] | | 21 [18,27] | | | | |
| ≤20 n (%) | | 147 (48.67) | 17.24 (4.85) | 0.001* | 3.63 (1.19) | 0.58 |
| >20 n (%) | | 155 (51.32) | 18.70 (5.53) | | 3.72 (1.12) | |
| Gendern (%) | Male | 139 (46) | 18.49 (5.28) | 0.08 | 3.71 (1.18) | 0.44 |
| | Female | 163 (54) | 17.56 (5.21) | | 3.65 (1.13) | |
| Academic leveln (%) | First year | 34 (11.30) | 15.76 (4.89) | <0.001*** | 3.65 (1.12) | 0.79 |
| | Second year | 99 (32.80) | 17 (5.16) | | 3.62 (1.24) | |
| | Third year | 95 (31.50) | 18.88 (5.10) | | 3.61(1.20) | |
| | Fourth year | 74 (24.50) | 19.20 (5.31) | | 3.85 (0.97) | |
| Work experience in medical centers n (%) | Yes | 61 (20.20) | 19.11(5.67) | 0.004* | 3.72 (1.19) | 0.71 |
| | No | 241 (79.80) | 17.71(5.12) | | 3.66 (1.14) | |
| Work experience in COVID-19 centers n (%) | Yes | 26 (8.60) | 21.10 (3.62) | <0.001*** | 4.23 (0.86) | 0.01* |
| | No | 276 (91.40) | 17.70 (5.30) | | 3.63 (1.17) | |
| Infection with COVID-19 n (%) | Yes | 101 (33.40) | 17.79 (5.89) | 0.90 | 3.72 (1.15) | 0.55 |
| | No | 201 (66.60) | 18.10 (4.92) | | 3.65 (1.15) | |

Note: SD = standard deviations; min = minimum; max = maximum; [a] P- values are obtained from Mann–Whitney U test or Kruskal–Wallis test;*p < 0.05, ***p < 0.001.

### *Knowledge about COVID-19*

The minimum, maximum, 50th, and 75th percentiles of total knowledge scores were obtained in the following order: 0, 27, 19, and 22. The mean (SD) of the total knowledge score was 17.99 (SD = 5.26). The total correct answer rate was 60% (Table 2). Based on the total knowledge score classification, 55.30%, 18.50%, and 26.20% were unsatisfactory, satisfactory, and excellent. Table 2 also shows the rates of the correct answers.

**Table 2.** Knowledge of nursing students about COVID-19 in the sample of the study (N = 302).

| Questions | Correct answer rate | Mean(SD)[a] | Median[a] [min, max] |
|---|---|---|---|
| The ways of transmission of COVID-19 | | 2.30(0.89) | 3 [0, 3] |
| 1. Close face-to-face contact | 84 % | | |
| 2. Contaminated hands with eyes | 82% | | |
| 3. Respiratory droplets such as cough and sneeze | 64% | | |
| Preventive and protective methods in COVID-19 | | 2.43 (0.74) | 3 [0, 3] |
| 1. Use of the standard mask | 89% | | |
| 2. Use of gowns while caring for patients | 62% | | |
| 3. Need air conditioning system in COVID-19 sections | 92% | | |
| Causes and clinical manifestations of COVID-19 | | 1.96 (0.86) | 2 [0, 3] |
| 1. Dry cough, shortness of breath, and fever | 89% | | |
| 2. leukopenia and lymphopenia complications | 59% | | |
| 3. Skin complications | 48% | | |
| Vulnerable people in COVID-19 | | 2.47(0.78) | 3 [0, 3] |
| 1. People with underlying conditions (heart, lung disease, cancer and diabetes. | 88% | | |
| 2. The elderly and pregnant women | 89% | | |
| 3. People with BMI> 40 | 69% | | |
| The course of the COVID-19 | | 1.47(1.08) | 1 [0, 3] |
| 1. Symptoms can take up to 14 days to develop, and the virus can be transmitted to others. | 38% | | |
| 2. The average incubation period is 4–5 days | 39% | | |
| 3. Returning to work after at least three days of recovery (stop respiratory symptoms and fever), regardless of infection. | 70% | | |
| Treatment for COVID-19 | | 1.23 (0.97) | 1 [0, 3] |
| 1. Use of NSAIDs based on the FDA recommendation | 20% | | |
| 2.Use of acetaminophen to control fever | 64% | | |
| 3. Use of dexamethasone in the acute phase | 39% | | |
| Hypoxia and oxygen administration in COVID-19 | | 1.51(1.11) | 2 [0, 3] |
| 1. Use of the nasal cannula in mild hypoxia | 43% | | |
| 2. Use of the simple mask for oxygen in moderate hypoxia | 56% | | |
| 3. Use of the oxygen mask with reservoir bag in severe hypoxia | 51% | | |
| Nursing care in patients with COVID-19 | | 1.12 (0.97) | 1 [0, 3] |
| 1. Recommendation of cold and wet oxygen for patients | 29% | | |
| 2. Monitoring of patients using septic shock in the acute phase | 57% | | |
| 3. Change the patient's intubation every 48 hours to reduce infection | 26% | | |
| Monitoring of patients suspected of COVID-19 | | **2.35 (0.99)** | **3 [0, 3]** |
| 1. Attention to respiratory problems in triage | 77% | | |
| 2. Question about close contact with suspected people in the last two weeks in triage. | 80% | | |
| 3. Question about a sore throat or severe feeling of dry throat and headache in triage | 79% | | |
| Diagnostic test in patients with or suspected COVID-19 | | **1.16 (0.87)** | **1 [0, 3]** |
| 1. Use of a cotton swab to sample the upper respiratory tract | 60% | | |
| 2. Use of both swaps in the same tube after sampling from the nasopharynx and oropharynx. | 42% | | |
| 3. View ground-glass nodule on CT scan | 14% | | |
| Total | 60% [b] | **17.99 (5.26)** | **19 [0,27]** |

Note: [A] Descriptive statistics related to the sum of knowledge scores; [b] sum of correct answers rate; SD = standard deviation.

**Table 3.** The attitude of nursing students about COVID-19 in the sample of the study (N = 302).

| Items | values |
|---|---|
| Are you volunteer for nursing care of COVID-19 patients? | |
| Yes n (%) | 166 (55) |
| No n (%) | 136 (45) |
| Is it necessary to use advanced scientific references to improve your knowledge about the COVID-19? | |
| Yes n (%) | 242 (80.10) |
| No n (%) | 60 (19.90) |
| Do you encourage others to follow the COVID-19 guidelines? | |
| Yes n (%) | 265 (87.70) |
| No n (%) | 37 (12.30) |
| Do you follow the WHO recommendations to update your knowledge about COVID-19? | |
| Yes n (%) | 211 (69.90) |
| No n (%) | 91 (30.10) |
| If you get infected with the COVID-19 virus, will you let others know? | |
| Yes n (%) | 227 (75.20) |
| No n (%) | 75 (24.80) |
| Total scores | |
| Yes n (%) | 3.68 ± 1.15 |
| No n (%) | 4 [0, 5] |

Note: Correct answer means yes; incorrect answer means no. Total scores = the sum of all attitude items.

### *Attitude about COVID-19*

Table 3 reports frequencies of correct and incorrect responses of nursing students about COVID-19 attitude. The total attitude scores for the nursing students were in ranged from 0 to 5, with a median value score of 4. The mean (SD) total score of attitude was 3.68 (SD = 1.15) (Table 3).

### *The relationship between the total scores of knowledge and attitude*

Figure 1 presents the results of the Spearman correlation coefficient between knowledge and attitude about COVID-19. There was a significant positive relationship between the total knowledge and attitude scores ($r = 0.23$, $p < 0.001$).

### *Factors affecting the COVID-19 knowledge score of nursing students*

The ordinal logistic regression model was used to predict factors influencing nursing students' COVID-19 knowledge score levels (unsatisfactory, satisfactory, and excellent). Based on the results of Univariate ordinal logistic regression, factors including age, gender, academic level, work experience in medical centers, and work experience in COVID-19 centers were significant (Table 4). The nursing students in the age group of ≤20 years old had significantly less knowledge about COVID-19 than those in the >20 years group (OR = 0.48 (95%CI:0.31,0.75), p = 0.001). Besides, the first and second-year academic level nursing students had significantly less knowledge about COVID-19 than those at higher academic levels (OR = 0.14 (95%CI: 0.05,0.38), OR = 0.31 (95%CI:0.17,0.55), p < 0.001). The odds of having excellent knowledge in nursing students with work experience in medical centers was 2.44 times that of those without experience ((95%CI:1.44,4.13), p = 0.001). The odds of having excellent knowledge in nursing students with work experience in COVID-19 centers was 3.93 times more than others ((95%CI:1.86,8.30), p < 0.001).

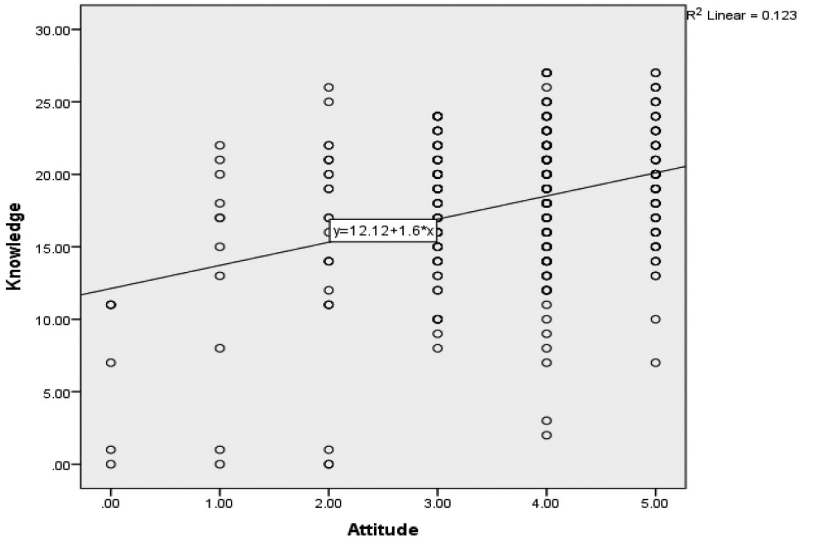


**Figure 1.** Correlation between attitude and knowledge of nursing students in Iran (Spearman correlation coefficient = 0.23, $p < 0.001$).

The multivariate ordinal logistic regression model determined gender and academic level as the most influential factors. The results demonstrated that the odds of having excellent knowledge in male students was 1.62 higher than in females ((95%CI: 1.02, 2.56), p = 0.04; Table 4). For nursing students at a first-year academic level, there was an

**Table 4.** Factors associated with knowledge of nursing students about COVID-19 (Ordinal logistic regression).

| | | Univariate | | | multivariate | | |
|---|---|---|---|---|---|---|---|
| Factor | | B | OR(95% CI) | P-value | B | OR(95% CI) | P-value |
| Age | ≤20 | −0.73 | 0.48 (0.31,0.75) | 0.001* | - | | |
| | >20 [a] | - | | | | | |
| Gender | Male | 0.51 | 1.66 (1.07,2.58) | 0.02* | 0.48 | 1.62 (1.02,2.56) | 0.04* |
| | Female [a] | - | | | - | | |
| Academic level | First year | −1.95 | 0.14 (0.05,0.38) | <0.01*** | −1.61 | 0.20 (0.07,0.59) | 0.004* |
| | Second year | −1.18 | 0.31 (0.17,0.55) | <0.001*** | −0.83 | 0.44(0.21, 0.90) | 0.02* |
| | Third year | −0.22 | 0.80(0.46, 1.41) | 0.45 | - | | |
| | Fourth year [a] | - | | | - | | |
| Work experience in medical centers | Yes | 0.89 | 2.44 (1.44,4.13) | 0.001* | - | | |
| | No [a] | - | | | - | | |
| Work experience in COVID-19 centers | Yes | 1.37 | 3.93 (1.86,8.30) | <0.001*** | - | | |
| | No [a] | - | | | - | | |
| Infection with COVID-19 | Yes | 0.21 | 1.23 (0.77,1.94) | 0.38 | - | | |
| | No [a] | - | | | - | | |

Note:B = regression coefficient; OR = Odds Ratio; [a] reference category; Dependent variable = knowledge score levels (unsatisfactory, satisfactory, excellent);*p < 0.05,***p < 0.001.

80 % decrease in odds of having excellent knowledge than the fourth year (OR = 0.20 (95%CI: 0.07, 0.59), p = 0.004, Table 4). The odds of having excellent knowledge in the second year academic level students were 56% lower than the fourth year (OR = 0.44 (95%CI: 0.21,0.90), p = 0.02, Table 4).

## Discussion

This study determined the Iranian nursing students' levels of knowledge and attitudes towards COVID-19 in 2020. The study results showed that 26.20% of the nursing students had excellent levels of knowledge about COVID-19, which were lower than the ones reported in other countries such as Oman (Alshdefat et al. 2021), Australia and India (Kochuvilayil et al. 2021), Italy (Provenzano et al. 2020), Saudi Arabia (Albaqawi et al. 2020), and the Philippines (Quisao, Tayaba, and Soriano 2021) because the majority of the nursing students in the given surveys had shown high levels of knowledge. However, the nursing students' levels of knowledge in some countries, such as Palestine (Ayed and Zabn 2021) and Mexico (Medina Fernández et al. 2021), were lower than the results in the present study. One reason for the discrepancy in the levels of knowledge could be concluded that the nursing students of all academic years participated in the present study in such a way that the first- and second-year students constituted almost half of the respondents (44.1%). These students had received less clinical education, while the questionnaire items were more specialized and related to clinical practices, such as triage along with nursing care and treatment of patients. In addition, according to the conditions and methods of medical education and the degree of involvement with COVID-19 in different countries, the levels of knowledge among nursing students were different.

Respectively, the higher levels of knowledge were about the ways of transmission of the virus, preventive and protective measures against droplet transmission, vulnerable people in times of COVID-19, and the observation and monitoring of COVID-19 patients suspected, but the lowest levels of knowledge were associated with nursing care for COVID-19 patients, sampling method for diagnostic purposes, medications used during COVID-19 treatment, and the clinical course of COVID-19. In a previous report in Saudi Arabia, the nursing students also had the highest levels of knowledge related to COVID-19 prevention and control, which was consistent with the present study (Albaqawi et al. 2020). The reason might be the extensive publicity activities about COVID-19 prevention and modes of transmission. Health education in the field of knowledge of prevention and disease control is thus essential because it prevents infection and decelerates the transmission of the virus. The study findings accordingly showed that the nursing students were adhering to the recommendations declared by the WHO to avoid and control COVID-19, well understand its importance through gaining knowledge of preventive measures and believe it. The high levels of knowledge and such beliefs may act as protective measures and draw the nursing students' attention towards the importance of the issue and the need to comply with protective measures to prevent infection.

Among other significant findings in this study were the students' positive attitudes towards COVID-19 that corresponded with other reports (Alshdefat et al. 2021; Provenzano et al. 2020; Quisao, Tayaba, and Soriano 2021). Of the items related to

attitudes, only half of the students (55%) showed their readiness concerning the item of readiness and cooperation for nursing care of COVID-19 patients. The reason could be the fear and anxiety of the nursing students about risking their lives.

Knowledge is a prerequisite for developing preventive beliefs, shaping optimistic attitudes, promoting positive behaviors, and raising people's knowledge and attitudes towards diseases can also lead to the effectiveness of coping strategies and behaviors (McEachan et al. 2016). This study similarly found that knowledge could directly affect attitudes so that people who had more knowledge about COVID-19 had positive attitudes towards it. Several observations in China, Saudi Arabia, the Philippines, Italy, Australia, and India have further shown that knowledge and attitudes could have significant impacts on performance and make people feel confident (Albaqawi et al. 2020; Kochuvilayil et al. 2021; Provenzano et al. 2020; Quisao, Tayaba, and Soriano 2021; Zhang et al. 2020).

The study results also revealed a significant relationship between knowledge and demographic characteristics. Older nursing students, those enrolled in higher academic levels, and those with a long history of work experience in health care centers had higher levels of knowledge about this condition. The results of surveys in other countries had further demonstrated a good level of knowledge regarding COVID-19 among nursing students, especially in older ones and those with higher levels of education, which was similar to the findings of the present study (Albaqawi et al. 2020; Alshdefat et al. 2021). The third- and fourth-year students, especially the final-year ones, seemed to have spent more time in clinical departments and had higher academic levels, so it is essential to ensure that nursing students at all levels have equal access to COVID-19 information resources to fill the scientific gap at different levels.

A statistically significant relationship was also observed between attitudes and work experience in COVID-19 centers so that students working in such centers had positive attitudes towards this condition. It seemed that having work experience regarding care for COVID-19 patients could lead to less fear and anxiety, enhanced perception and knowledge, and decreased the sense of risks.

## Limitations

Because of the COVID-19 outbreak, adherence to health protocols, and performing social distancing, the nursing students provided the questionnaire via a web-based survey. The findings were limited to students who had access to the Internet. Students enrolled in internship courses were not included in this study since they had no online classes.

## Conclusion

The study results showed that the levels of knowledge in nursing students about COVID-19 were moderate, and their attitudes were relatively positive. Therefore, to prepare the nursing students to care for COVID-19 patients, it is necessary to increase their levels of knowledge based on their needs. They should be provided with the latest updates on COVID-19 and obtain further information from valid sources.

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## Disclosure statement

No potential conflict of interest was reported by the author(s).

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