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The Effectiveness of Infection Control and Isolation Education for COVID-19 Among Turkish Senior Nursing Students: A Quasi-Experimental Study

COVID-19'da Enfeksiyon Kontrolü ve İzolasyona Yönelik Türk Intern Hemşirelik Öğrencilerine Verilen Eğitimin Etkinliği: Yarı Deneysel Çalışma

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ABSTRACT

Background: The literature emphasizes the importance of preparing the educational content of senior students, especially for the care of patients with COVID-19 infection. **Aim:** This study aims to evaluate the effect of an online training application for infection control, and isolation on students' knowledge level, their anxiety towards COVID-19, perceived stress, and occupational risk perception levels.

Methods: Quasi-experimental research using a pretest-posttest design was conducted in the study. The study took place at the Faculty of Health Sciences, Department of Nursing in XX. This study was conducted with 56 volunteer last grade nursing students. Online training for infection control and isolation in the nursing care of the patients with COVID-19 infection was applied by the researchers.

Results: It was found that the correct response rates that question about the care of the patient with COVID-19 infection statistically significantly increased after the training (p<.05). Also, there was a statistically significant decrease in perceived stress and anxiety, the occupational risk perception of the students after the training (p<.05).

Conclusion: Online training relating to infection control, and isolation in association with COVID-19 increases the knowledge of senior nursing students in relation to this subject, reduces stress, anxiety and the perceived professional risk levels.

Keywords: anxiety, COVID-19, infection control, isolation, nursing, occupational risk

ÖZET

Giriş: Literatür, özellikle COVID-19 enfeksiyonlu hastaların bakımı için son sınıf öğrencilerinin eğitim içeriğinin hazırlanmasının önemini vurgulamaktadır.

Amaç: Bu çalışma, enfeksiyon kontrolü ve izolasyon için online eğitimin öğrencilerin bilgi düzeyine, COVID-19'a yönelik kaygılarına, algılanan strese ve mesleki risk a düzeylerine etkisini değerlendirmeyi amaçlamaktadır.

Metod: Araştırma, ön test-son test deseniyle yarı deneysel olarak yapılmıştır. Çalışma Türkiye'deki bir devlet üniversitesinin hemşirelik bölümünde gerçekleştirildi. Bu çalışma 56 gönüllü son sınıf hemşirelik öğrencisi ile yapılmıştır. Araştırmacılar tarafından COVID-19 enfeksiyonu olan hastaların hemşirelik bakımında enfeksiyon kontrolü ve izolasyonu için online eğitim uygulandı.

Bulgular: Eğitim sonrasında COVID-19 enfeksiyonu olan hastanın bakımı ile ilgili sorulan sruların doğru yanıt oranlarının istatistiksel olarak anlamlı şekilde arttığı görüldü (p <.05). Ayrıca öğrencilerin eğitim sonrası algılanan stres ve kaygı, mesleki risk algılarında istatistiksel olarak anlamlı bir azalma saptandı (p <.05).

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Sonuç: COVID-19 ile ilişkili enfeksiyon kontrolü ve izolasyon ile ilgili online eğitim, hemşirelik son sınıf öğrencilerinin bu konudaki bilgilerini artırır, stresi, kaygıyı ve mesleki risk algılarını azaltır.

Anahtar Kelimeler: Anksiyete, COVID-19, enfeksiyon kontrolü, izolasyon, hemşirelik, mesleki risk

INTRODUCTION

On December 31, 2019, the World Health Organization (WHO) China Country Office reported pneumonia cases of an unknown etiology in Wuhan, in the chinese province of Hubei. On January 7, 2020, the causative agent was identified as a new coronavirus (2019-nCoV) that has not previously been detected in humans.[1] Later, the name of the 2019-nCoV disease was accepted as COVID-19, and the virus was named as SARS-CoV-2 because of its close resemblance to SARS CoV.[2]

Current evidence suggests that COVID-19 is transmitted through close contact and droplets among people. Literature ststes that healthcare workers and nurses are particularly afraid of the risk of transmission, especially in the care of patients with COVID-19 infection.[3,4] Those who are most at risk of getting this disease are those who have contact with patients and those who care for them. Therefore, nurses who care for these patients are considered to be at a high risk of infection, and the protection of nurses is considered as one of the most important priorities. [5,6]

In the COVID-19 epidemic in Italy, 2629 health personnel were reported to be infected and the proportion of those infected in the whole community was 8.3%.[7] By 24 February in China, 3387 health personnel were infected with COVID-19 and it was reported that 22 (0.6%) had died.[8] According to the latest data relating to health personnel in Turkey, 7428 are known to be infected.[9] It is thought that the most important factor in the occurrence of these results is that the healthcare worker who is in contact with COVID-19 does not know, is unaware, and does not sufficiently apply these infection prevention strategies.[10,11]

COVID-19 education following the country's first case was suspended after being notified of events in Turkey. Distance training was started in order to ensure continuity of the training. This way, nursing undergraduate programs in the country are continued. Students who graduate from the undergraduate program are likely to provide care to patients with COVID-19 infections or suspects in clinical practice. In our country therefore, Turkish Nurses Association emphasizes the importance of preparing the educational content of senior students, especially for the care of patients with COVID-19 infection.[12] Therefore, educators must work ever-harder to embed online training strategies that support student well-being and foster emotional resilience, into their curriculums.[13]

METHODS

Study Aim and Design

This study aims to evaluate the effect of an online training application for infection control and isolation on students' knowledge level, their anxiety towards COVID-19, perceived stress and occupational risk perception levels. Quasi-experimental research using pretest-posttest design was conducted in the study. The study complied with the guidelines of Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) checklist.

The purpose of the study was to evaluate three research hypotheses as follows:

Hypothesis 1: Online training concerning infection control and isolation in relation to COVID-19 is effective in increasing students' knowledge of this subject.

Hypothesis 2: Online training concerning infection control and isolation in relation to COVID-19 is effective in reducing students' anxiety level and perceived stress towards COVID-19.

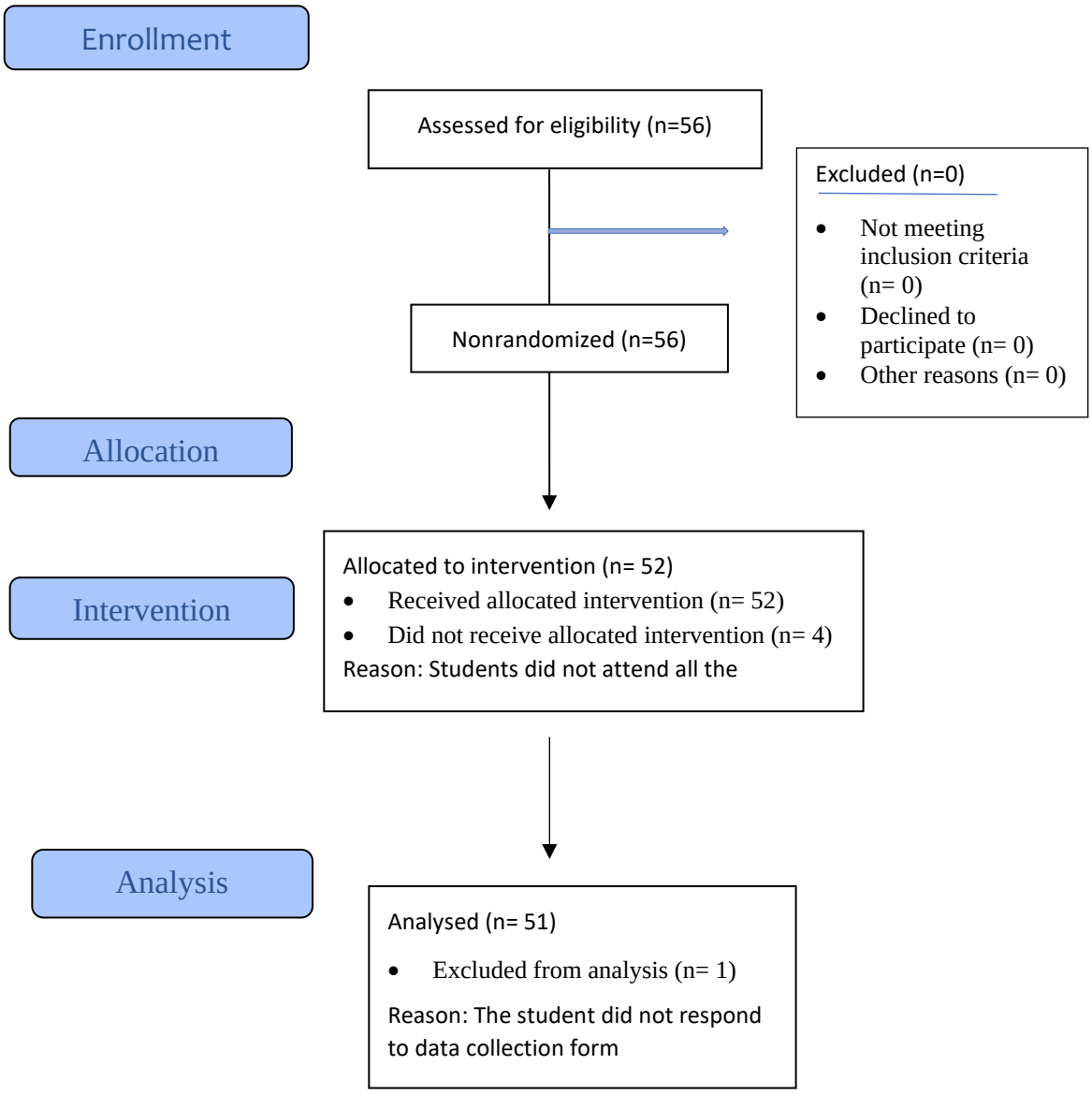
Hypothesis 3: Online training concerning infection control and isolation in relation to COVID-19 positively affects students' perceptions of professional risk.

Study Participants

This study was conducted with 56 volunteer last grade nursing students studying at the Faculty of Health Sciences, Department of Nursing in Istanbul, Turkey between March and April 2020. Students included in the study were required to meet the eligibility criteria of (a) being 18 years old or above, (b) study as a senior student, (c) enrolled in the online COVID-19 course (d) participation in all of the online courses. Senior nursing students were preferred in the sample selection of the study, as they will care for their COVID-19 patients when they graduate. The study was completed with 51 students. The flow diagram created by the researchers was based on TREND (Figure 1).

TREND Flow Diagram

Fig. 1. Allocation of subjects according to the TREND Flow Diagram



Intervention

Data Collection Procedures

The video shootings were made by collaborating with the nurses working in the hospital, based on the information created by the researcher in line with the literatüre.[5,12]

Then, 90 minutes of training (4-sessions lasting 90 mins) was given to the students by the researchers over 4 days. The content, purpose, and target of the training are given in table 1. By providing a online connection, full participation of all students was ensured in all of the 4 sessions. Data collection tools were applied at the start of the first training session and at the end of the last session.

Table 1. Contents of the infection control and isolation program

The name of the education	Infection control and isolation for COVID-19
The duration of the education	4 sessions, 90 minutes per session
The participants of the education	Nursing students who have reached the graduate stage
The objective of the education	To have knowledge and skills about all infection control and isolation (contact, droplet) measures applied during the care of the patient with COVID-19 infection.
The outcomes of the education	- Be able to explain the standard infection control and isolation measures applied during the care of the patient with COVID-19 infection. - Be able to explain the proper donning and doffing of personal protective equipment used during the care of the patient with COVID-19 infection. - Be able to explain the arrangement of the patient's environment during the care of the patient with COVID-19 infection and after the discharge of the patient. - Be able to explain the infection control measures that are taken during the transport of the patient with COVID-19 infection. - Be able to explain nursing care with appropriate infection control methods of the patient who died due to COVID-19 infection.
Teaching methods of education	Lecture, Discussion, Question-Answer, Demonstration, Simulation, Video, Brainstorming.
Materials used in education	Video, computer, online interview application
Content of the education	- Basic information about COVID-19 - Standart infection control measures, - Drop and contact isolation measures - Use of Personal Protective Equipment - Arrangement of the patient environment - Patient transport with COVID-19 infection - Post-mortem care due to COVID-19 infection
Evaluation of education	COVID-19 Infection Control and Isolation Information Form, Anxiety Form for COVID-19, Perceived Stress Scale, Occupational Risk Perception Scale in Nursing Students

Data Collection Tools

The data were collected on 4 forms: " Descriptive Characteristics Form" " COVID-19 Infection Control and Isolation Information Form", " Anxiety Form for COVID-19" and " Occupational Risk Perception Scale among Nursing Students".

Descriptive Characteristics Form

In this form, there were 12 questions relating to the presence of COVID-19 infection, risk factors for infection, source of information, how long the patient received information about COVID-19 daily as well as socio-demographic factors.

COVID-19 Infection Control and Isolation Information Form

The following were asked in the information form prepared by the researchers; In the room of the patient with a COVID-19 infection, infection control and isolation measures, personal protective equipment used and the wearing and removal order of this equipment. In the preparation of the questions, the opinions of 3 nurses with a doctorate were asked as well as 2 nurses who provide care in the hospital.

Anxiety Form for COVID-19

In the form prepared by the researchers in line with the literature,[4,14,15] 14 questions were asked concerning the anxiety status associated with the care of patients with COVID-19 infection, as well as questions concerning the conditions that cause anxiety among healthcare workers. In the preparation of the form, the opinions of 3 nurses with a doctorate were asked as well as 2 nurses who provide care in the hospital.

Perceived Stress Scale

The Perceived Stress Scale (PSS) was developed by Cohen et al.[16] The Turkish validity and reliability study was performed by Eskin et al.[17] The results obtained from this study indicate that PSS-14 have sufficient reliability. In the

study, where the scale was adapted to the Turkish population, the Cronbach Alpha internal consistency coefficient was calculated as 0.84, and in this study, it was determined that the Cronbach Alpha internal consistency coefficient was 0.84. Consisting of 14 items in total, PSS is designed to measure how stressful several situations in a person's life are perceived. The participants evaluate each item on a 5-point Likert scale ranging from "Never (0)" to "Very often (4)". 7 of the items containing positive statements are scored in reverse (4-5-6-7-9-10-13). While the scores of PSS-14 vary between 0 and 56, the high score indicates the excessive perception of the person's stress.

Occupational Risk Perception Scale in Nursing Students

This scale was developed by Aksoy[18] to determine the perceptions of nursing students concerning professional risks encountered in working life; It is a five-point Likert type and consists of 17 questions. The scale consists of 3 sub-dimensions: "Psychological and Ergonomic Risks", "Person and Institutional Risks" and "Physical Space Risks". There are no negative points or negative items in terms of the factor on the scale. The score that can be obtained from the scale varies between 17 and 85. The high score obtained from the scale indicates that the working environment is perceived as high risk and awareness is high, while the decrease in score indicates that the working environment is perceived as low risk, and the awareness decreases. The reliability coefficient of the scale was 0.82. In this study, the reliability coefficient was found to be 0.83.

Ethical Considerations

Approval was taken from the XX University's Ethics Committee (approval number: XX) before the study commenced. After informing the students about the study, the students who agreed to participate read and signed the consent forms prepared for each group. Online permission was taken from the university where the study was conducted. The study was conducted in compliance with the "Ethical principles for medical research involving human subjects" of the Helsinki Declaration.

Data Analysis

Data were analyzed using SPSS (Statistical Package for Social Sciences, Chicago, Illinois) version 25.0. The Shapiro Wilks test was used to assess whether the data had a normal distribution. Frequencies, percentages, mean values and standard deviation were calculated in the statistical evaluation of the data. The McNemar-Bowker Test was used to determine the difference between the percentages in the answers given before and after the training. The Wilcoxon Signed-Rank test was also used to determine the difference between the scale mean scores. All results were considered meaningful at $p < .05$ and there was a confidence interval of 95%.

RESULTS

The average age of students was 21.27 ± 0.91, 94.1% of them were women, 62.5% of them were in economic status equal to income and expenditure and 21.5% of their families lived in the village. 33.2% of students had COVID-19 infected people in their families. The majority of information related to COVID-19 (82.7%) consisted of TV reports and social media. Students reported that they spent an average of 3.5 hours a day learning about COVID-19. While the level of perception of occupational risk among students with COVID-19 infected people in their family is higher than others, there was no significant difference in these groups following training. Except for this, there was no statistically significant difference between all these introductory features and the levels of knowledge, anxiety, perceived stress and occupational risk perception ($p < .05$).

The study found that the correct response rates increased before and after the education in the question with regard to the infection control and isolation measures applied in the patients' room, transportation and after the death of the patient with COVID-19 infection, and that this situation was statistically significant ($p < .05$). The question of the order of putting protective equipment on and taking it off was found to be correct in favor of the posttest, with the majority of students (82.4%) correct after the training and between the pre-test and post-test answers ($p < .001$) (Table 2).

Table 2. Information status for COVID-19 isolation before and after education testing

	Pre- Test n (%)	Post Test n (%)	x^2	*p*
Infection control and isolation measures applied in the room of the patient with COVID-19 infection				
True	26 (51)	44 (86.3)		
False	2 (3.9)	3 (5.9)	13.89	.03
Missing	23 (45.1)	4 (7.8)		
Infection control and isolation measures during transport of the patient with COVID-19 infection				
True	25 (49)	39 (76.5)		
False	3 (5.9)	5 (9.8)	9.00	.029
Missing	23 (45.1)	7 (13.7)		
Infection control and isolation measures in care and burial services after death due to COVID-19				
True	25 (49)	41 (80.4)		
False	16 (31.4)	4 (7.8)	11.09	.011
Missing	10 (19.6)	6 (11.8)		
The order of wearing personal protective equipment				
True	19 (37.3)	42 (82.4)		
False	5 (9.8)	3 (5.9)	20.36	< .001*
Missing	27 (52.9)	6 (11.8)		
The order of removal of personal protective equipment				
True	32 (62.7)	42 (82.4)		
False	16 (31.4)	5 (9.8)	10.66	.014
Missing	3 (5.9)	4 (7.8)		

Note. n: Number of participants, %: Percentage, X^2: McNemar-Bowker Test, * p < .001

Statistically, the study found that the ratio of the students' anxiety about Covid-19 decreased significantly after the training (p < .001) (Table 3).

Table 3. Students' anxiety before and after the education about COVID-19

Variable Category	Pre- Test n (%)	Post- Test n (%)	x^2	*p*
I am anxious that I will care for patients with COVID-19				
Yes	17 (33.3)	11 (21.6)		
No	12 (23.5)	33 (64.7)	18.56	< .001*
Hesitant	22 (43.1)	7 (13.7)		
I think I'm inexperienced to care for COVID-19 patients				
Yes	29 (56.9)	11 (21.6)		
No	10 (19.6)	33 (64.7)	19.77	< .001*
Hesitant	12 (23.5)	7 (13.7)		
I am anxious about very busy working hours due to COVID-19				
Yes	24 (47.1)	11 (21.6)		
No	10 (19.6)	33 (64.7)		
Hesitant	17 (33.3)	7 (13.7)	16.03	.001
I am anxious that I may be infect while taking care of COVID-19 patients				
Yes	26 (51)	11 (21.6)		
No	9 (17.6)	33 (64.7)	24.09	< .001*
Hesitant	16 (31.4)	7 (13.7)		
I am anxious about losing my life because of COVID-19				
Yes	26 (51)	11 (21.6)		
No	11 (21.6)	33 (64.7)	16.29	.001
Hesitant	14 (27.5)	7 (13.7)		

I am anxious that I will infect COVID-19 to my family/people around me				
Yes	35 (68.6)	11 (21.6)		
No	11 (21.6)	33 (64.7)	20.05	< .001*
Hesitant	5 (9.8)	7 (13.7)		
I am anxious that if I infect COVID-19 into one of my family/people, that person will die				
Yes	28 (54.9)	5 (9.8)		
No	12 (23.5)	35 (68.6)	21.19	< .001*
Hesitant	11 (21.6)	11 (21.6)		
I am anxious that there may be insufficient/incomplete personal protective equipment				
Yes	36 (70.6)	11 (21.6)		
No	9 (17.6)	33 (64.7)	21.33	< .001*
Hesitant	6 (11.8)	7 (13.7)		
I am anxious about the wrong donning of personal protective equipment				
Yes	29 (56.9)	5 (9.8)		
No	15 (29.4)	35 (68.6)	20.84	< .001*
Hesitant	7 (13.7)	11 (21.6)		
I am anxious about getting infected even when I wear personal protective equipment				
Yes	25 (49)	5 (9.8)		
No	4 (7.8)	35 (68.6)	31.88	< .001*
Hesitant	22 (43.1)	11 (21.6)		
I am anxious about the wrong doffing of personal protective equipment				
Yes	24 (47.1)	5 (9.8)		
No	18 (35.3)	35 (68.)	16.4	.001
Hesitant	9 (17.6)	11 (21.6)		
I am anxious that personal protective equipment may be insufficient				
Yes	24 (47.1)	5 (9.8)		
No	5 (9.89	35 (68.6)	26.56	< .001*
Hesitant	22 (43.1)	11 (21.6)		
I am anxious that I cannot wash my hands properly after taking care of COVID-19 patients				
Yes	11 (21.6)	5 (9.8)		
No	22 (43.1)	35 (68.6)	10.37	.016
Hesitant	18 (35.3)	11 (21.6)		
I am anxious that the personal protective equipment that I use can injure my body				
Yes	11 (21.6)	5 (9.8)		
No	17 (33.3)	35 (68.6)	11.77	.008
Hesitant	23 (45.1)	11 (21.6)		

Note. n: Number of participants, %: Percentage, X^2: McNemar-Bowker Test, * p < .001

The study also found that the students' mean perceived stress score before education was 46.50 ± 10.98 and 30.80 ± 9.00 after education, and that this difference was statistically significant (p < .001). There was a statistically significant decrease in the sub-dimensions relating to Nursing Students' Occupational Risk Perception Scale and Psychological and Ergonomic Risks, Individual and Institutional Risks, Physical Space Risks (p < .001) (Table 4).

Table 4. Pre-post Test Analysis of Perceived Stress Scale and Occupational Risk Perception Scale Scores in Nursing Students

	Time	Mean ± *SD*	*Z*	*p*
Perceived Stress Scale	Before	46.50±10.98	-5.96	< .001*
	After	30.80±9.00		
Occupational Risk Perception Scale in Nursing Students	Before	71.09±10.71	-5.84	< .001*
	After	48.66±10.76		
- **Psychological and Ergonomic Risks Subscale**	Before	29.25±4.39	-5.15	< .001*
	After	18.52±8.94		
- **Person and Institutional Risks Subscale**	Before	20.92±3.16	-3.63	< .001*
	After	17.84±4.55		
- **Physical Space Risks Subscale**	Before	20.92±3.16	-6.12	< .001*
	After	12.29±4.19		

Note. Z: Wilcoxon Signed Rank Test, SD: Standart Deviation, *p < .001.

DISCUSSION

In order to provide Covid-19 infected patients with the most effective and reliable health services possible, the safety of healthcare professionals is important. For this reason, studies have reported that educational materials should be integrated into the undergraduate curriculum of healthcare professionals.[12,13,19] In this regard, the effectiveness of online training given to the senior nursing students with protection from COVID-19 infection was evaluated in our study.

Christensen et al.[20] evaluated the effectiveness of online and instructor-led training for healthcare providers related to the proper putting on/taking off of personal protective equipment. According to the results of the study, they found that the participants who received video training were, on average just as able as those who received training under the leadership of the trainer. [20] According to the results of our study, it can be seen that the students are significantly more successful in the room of the patient with COVID-19 infection, as well as in dealing with transport issues and post-death infection control/isolation measures. These results are an important finding in terms of their safety, given that students will soon care for an individual who has become infected with COVID-19. Because standard infection and isolation measures are an important component of a system that protects the patient, healthcare staff and other patients with a COVID-19 cross-infection.[10,11] It is important for students to understand the purpose of these measures and their role in preventing disease transmission from patients to themselves, staff, and other people.[12,14,15]

COVID-19 is the first new occupational disease identified in the past decade.[6,21] Nurses who provide health care in every environment are exposed to professional risks as a result of the pandemic.[22] However, despite these risks, nurses have unique responsibilities in the COVID-19 outbreak. Regardless of the infection status of all patients, it is the primary role of nurses to provide individual-specific, effective and quality care. At the same time, nurses should be ready for increased nurse demand associated with COVID-19.[22] For this reason, the educator of nurses should provide training to nurses and nursing students in the clinic concerning the current risks of COVID-19 specific to their field of application. In our study, online training for COVID-19 infection control and isolation positively affected the professional risk perceptions of students. Similarly, there are studies in the literature that indicate that training given to nursing students is beneficial in terms of occupational risk.[23-25]

It is also stated in the literature that the change caused by this infection, which affects the world, as well as the physical safety of the healthcare personnel, and their psychological status should be taken into consideration.[19] With the same scale used in our study, the average perceived stress score among nursing students in one study[26] was found 21.55 ± 4.84, one study in our country[27] was found 27.53±7.00. In this study, the mean of this scale before training was 46.50 ± 10.98. This shows how intense the perceived stress is among the nursing students who will graduate. In the anxiety questions concerning COVID-19, the fact that the majority answered yes to the questions explained why this stress originated. However, the infection control and isolation measure-related training given to these situations may cause anxiety in students and this both reduced the average perceived stress score and positively changed the anxiety questions regarding COVID-19. It can be seen that students' understanding of the purpose of training and its role in providing safety is important in creating these results. This study also emphasizes the need for training videos to be tested to ensure the integrity, accuracy and clarity of the actions.

Limitation

There were some limitations of this study. First, it is difficult to generalize the study results to all students, as online education is applied only for senior nursing students in one city. Secondly, it was possible to evaluate students only on the cognitive level, since education was applied online. It is difficult to track changes in the application skills in the training content. Also, since the control group cannot be used in the research, it may create weaknesses in evaluating the effectiveness of the research.

CONCLUSION

In conclusion, COVID-19 is a disease that is most likely to be transmitted by contact and droplets. The infection agent in the hospital is a major threat to healthcare professionals. Nurses, which make up the largest majority of the healthcare team, are most in contact with their patients during care practices. Therefore, nurses have a high risk of infection transmission. Nurse educators have a great role in the preparation of senior students who may be exposed to this infection factor in care areas after a short time. The study shows that online training relating to COVID-19 infection control and isolation increases the knowledge of senior nursing students concerning this subject and positively affects their attitudes. When responding to the COVID-19 pandemic, it is important to reach the healthcare professionals who will contribute to this field through distance education without training being required. Thus, it is thought that the creation of training material that can reach more participants while maintaining social distance is a resource-efficient way. It is recommended to determine the impact of different training modules or strategies in order to ensure employee safety in the evolution of the pandemic.

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