ORIGINAL RESEARCH ORİJİNAL ARAŞTIRMA

DOI: 10.5336/healthsci.2024-101675

Physiotherapy Students' Knowledge Levels and Information Sources Regarding Protection While Contacting Cases During the COVID-19 Pandemic: Cross-Sectional Study

Fizyoterapi Öğrencilerinin COVID-19 Pandemisinde Vakalar ile Temas Ederken Korunmaya İlişkin Bilgi Düzeyleri ve Bilgi Kaynakları: Kesitsel Çalışma

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ABSTRACT Objective: Our aim is to investigate the knowledge and sources of information of physiotherapy students about the precautions to be followed when coming into contact with cases during the coronavirus disease-2019 (COVID-19) pandemic. **Material and Methods:** Our study is a cross-sectional study. An online form was created by the researchers. This form included 19 questions about isolation measures, personal protective equipment (PPE) and their appropriate use to prevent the transmission of COVID-19 infection, and the sources of information for students. **Results:** A total of 503 students participated (374 females, 129 males; mean age 20.82±1.83 years; 1st grade n=128, 2nd grade n=135, 3rd grade n=123 and 4th grade n=117). Students answered all questions about PPEs correctly at a rate of 82.3% to 95.0%. However, they gave less correct answers to the questions about the appropriate use of PPEs compared to other questions (65.2%-41.6%). The least correct answers were given to questions about the order of donning (62.2%) and doffing (49.7%) PPE such as gloves, goggles/face protection, aprons and masks. Students frequently obtained information about protective measures from healthcare professionals, websites and scientific articles (n=273 54.3%, n=263 52.3%, n=197 39.2%, respectively) and they most often accessed the information source between 18:00-24:00 on weekdays. **Conclusion:** Our study has revealed the deficiencies of physiotherapy students, a student group that may come into close contact with COVID-19 cases, in certain aspects. Our study may guide education planners about COVID-19 infection.

Keywords: COVID-19; isolation; personal protective equipment; resource guide

ÖZET Amaç: Amacımız, fizyoterapi öğrencilerinin koronavirüs hastalığı-2019 [coronavirus disease-2019 (COVID-19)] pandemisinde vakalar ile temas ederken uyması gereken önlemler hakkındaki bilgilerini ve bilgi edinme kaynaklarını araştırmaktır. **Gereç ve Yöntemler:** Çalışmamız kesitsel bir çalışmadır. Çalışmacılar tarafından çevrim içi bir form oluşturuldu. Bu form COVID-19 enfeksiyonunun bulaşını engellemek için gereken; izolasyon önlemleri, kişisel koruyucu ekipmanlar (KKE) ve bunların uygun kullanımı hakkındaki 19 soruyu ve öğrencilerin bilgi edinme kaynakları hakkındaki soruları içeriyordu. **Bulgular:** Toplam 503 öğrenci katıldı (374 kadın, 129 erkek; ortalama yaş 20,82±1,83 yıl; 1. sınıf n=128, 2. sınıf n=135, 3. sınıf n=123, 4. sınıf n=117). Öğrenciler KKE'ler hakkında yöneltilen tüm sorulara %82,3-95,0 oranında doğru yanıt verdiler. Ancak KKE'lerin uygun kullanımı hakkındaki sorulara diğer sorulara oranla daha az doğru yanıt verdiler (%65,2-41,6). En az doğru yanıt eldiven, gözlük/yüz koruyucu, önlük ve maske gibi KKE'lerin giyilme (%62,2) ve çıkarılma sırası (%49,7) hakkındaki sorulara verildi. Öğrenciler koruyucu önlemler hakkındaki bilgileri sıklıkla; sağlık çalışanlarından, web sitelerinden ve bilimsel makalelerden ediniyordu (sırasıyla n=273 %54,3, n=263 %52,3, n=197 %39,2) ve bilgi kaynağına en sık hafta içi 18:00-24:00 saatleri arasında ulaşıyorlardı. **Sonuç:** Çalışmamız, özellikle COVID-19 vakaları ile yakın temas edebilecek bir öğrenci grubu olan fizyoterapi öğrencilerinin belirli yönlerden eksiklerini ortaya koymuştur. Çalışmamız COVID-19 enfeksiyonu konusunda eğitim planlayıcılara yol gösterici olabilir.

Anahtar Kelimeler: COVID-19; izolasyon; kişisel koruyucu ekipman; bilgi kaynağı

TO CITE THIS ARTICLE:
Kul Karaali H, Özcan Ö. Physiotherapy students' knowledge levels and information sources regarding protection while contacting cases during the COVID-19 pandemic: Cross-sectional study. Turkiye Klinikleri J Health Sci. 2024;9(3):511-20.

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Peer review under responsibility of Turkiye Klinikleri Journal of Health Sciences.

Received: 25 Jan 2024 ***Received in revised form:*** 04 May 2024 ***Accepted:*** 09 May 2024 ***Available online:*** 16 May 2024

Coronavirus disease-2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), the virus which was first identified in November 2019 in Wuhan, China. COVID-19 has spread rapidly around the world. It was classified as a pandemic disease by the World Health Organization (WHO) in March 2020.[1] Clinical severity ranged from almost asymptomatic infection to a systemic disease that requires intensive care (sometimes leading to death).[2,3] It is known that the main route of human-to-human transmission of SARS-CoV-2 is through respiratory secretions, droplets and contact.[4,5] For this reason, hand hygiene, use of personal protective equipment (PPE) to prevent direct contact with the patient's blood, body fluids and secretions, cleaning and disinfection of equipment are among the standard measures to prevent the spread of the disease. It has also been reported that these measures should be maintained throughout the care process of patients under treatment. Therefore, it has gained importance that these standard precautions are adopted as natural behaviors by healthcare professionals.[3,6]

Physiotherapists played an important role during the pandemic like physicians, nurses and other healthcare professionals. They performed physiotherapy interventions, including pulmonary rehabilitation, mobilization and exercise, throughout the care process for patients being treated in hospital wards and intensive care units. Physiotherapists were also involved in chronic patient care to limit the functional consequences of disease.[7-9] Therefore, during the pandemic period, it became important for physiotherapists and physiotherapy students to have a high level of knowledge and awareness about coronavirus infection, routes and prevention of transmission, and compliance with standard precautions in patient care. And recommendations have been published on this subject.[10,11]

When the literature was reviewed, it was seen that the studies conducted so far focused on issues such as knowledge, transmission methods, prevention methods, awareness and attitudes of physiotherapists and physiotherapy students about COVID-19 infection. The focus of our study was on students who are interns and candidate healthcare professionals. As required by the curriculum, our students do internships in health institutions starting from the second grade. Although students are not actively involved in physiotherapy services, they may encounter patients in the healthcare setting. Therefore, they may become infected and/or spread the infection.

Therefore, in our study, we aimed to evaluate the level of knowledge of students about isolation methods and preventive measures such as PPE that should be followed when encountered with possible and definite COVID-19 cases. We also aimed to determine the ways in which they obtained information about these issues.

MATERIAL AND METHODS

This cross-sectional study was conducted among physiotherapy undergraduate students of our university. In February and March 2021, a web-based form was created using "Microsoft Forms (Microsoft, USA)" offered by Microsoft, which is a cloud-based survey data collection application. During the study, first, second, and third-grade students were receiving education through distance learning model, while fourth-grade students were receiving education through a hybrid learning model. This study was carried out in accordance with the Declaration of Helsinki. For this research was reviewed and approved by the institutional review board of Manisa Celal Bayar University Health Sciences Ethics Committee (date: February 03, 2021, no: 20.478.486-726).

PARTICIPANTS

The form was sent to 652 students enrolled in the department by sharing the form link via "WhatsApp (Meta, Inc. USA)". Those who volunteered were asked to complete the form. The completion and submission of the online form represents the informed consent of the participants as described in the introduction of the form.

DATA FORM

The data form was prepared based on the literature and information published on the official website of the Ministry of Health of the Republic of Türkiye by researchers.[10-15] Before the form was applied, it was

sent to two physiotherapy students for their opinions to make sure that all questions were easy to understand. Then, minor adjustments were made to some questions in the questionnaire and the form was prepared for data collection. In the form, the students were first asked about their age, gender, and the class they were enrolled in the program, and then 19 questions were asked about the isolation measures (question no: 1-3), PPE (question no: 4-11) and their appropriate use (question no: 12-19) that they should follow when they encounter COVID-19 cases. These questions were closed-ended questions with answers limited to three choices. The choices were true, false and don't know. And for all questions, "true" was the correct answer. Students were asked to choose the option that best reflected their situation while answering the questions. And finally, questions were asked about sources of information about COVID-19.

STATISTICAL ANALYSIS

Statistical analyzes were performed with IBM® SPSS® 26 (SPSS Inc., Chicago, IL, USA) software. Descriptive statistics; The mean±standard deviation values were given. Frequency and percentage values were given for discrete (categorical) variables. Pearson's chi-squared test or Fisher's exact test were used to compare the discrete data. p values less than 0.05 were considered statistically significant.

RESULTS

Among a total of 652 students (1st grade n=163, 2nd grade n=187, 3rd grade n=136 and 4th grade n=166), 133 (20.4%) students did not participate in the study, while 519 (79.6%) students participated in the study by answering the online form. Among these students, 16 (2.5%) were excluded from the study because they selected the option "I do not agree to participate in the study". The data of the remaining 503 (77.2%) students (1st grade n=128, 2nd grade n=135, 3rd grade n=123 and 4th grade n=117) were further analyzed for the study. The average response time was 17 minutes and 26 seconds. The mean age of the students was 20.82±1.83 years and 374 (74.4%) were female and 129 (25.6%) were male.

INFORMATION ABOUT ISOLATION METHODS (QUESTION NO: 1-3):

Students gave a highly correct answer to the first two questions asked about isolation methods (91.3% and 91.3% respectively). The rate of correct answers to the third question (If the patient is under noninvasive or invasive respiratory support therapy, respiratory isolation precautions should be followed) was lower than the first and second questions (73.0%), (Table 1).

TABLE 1: Information about methods of isolation.

	1st Grade n (%)	2nd Grade n (%)	3rd Grade n (%)	4th Grade n (%)	Total n (%)	p value*
Q1: Until COVID-19 infection is ruled out in possible cases: Standard, contact and droplet isolation measures should be taken.						
Correct	110 (85.9)	126 (93.3)	116 (94.3)	107 (91.5)	459 (91.3)	0.291
Incorrect	1 (0.8)	1 (0.7)	1 (0.8)	1 (0.9)	4 (0.8)	
I don't know	17 (13.3)	8 (5.9)	6 (4.9)	9 (7.7)	40 (8.0)	
Q2: In cases with a definitive diagnosis of COVID-19 infection, until the patient is discharged: Standard, contact and droplet isolation measures should be taken.						
Correct	111 (86.7)	125 (92.6)	115 (93.5)	108 (92.3)	459 (91.3)	0.199
Incorrect	3 (2.3)	1 (0.7)	4 (3.3)	3 (2.6)	11 (2.2)	
I don't know	14 (10.9)	9 (6.7)	4 (3.3)	6 (5.1)	33 (6.6)	
Q3: Respiratory isolation measures should be followed if the patient is under noninvasive or invasive respiratory support therapy.						
Correct	84 (65.6)	90 (66.7)	90 (73.2)	103 (88.0)	367 (73.0)	0.002
Incorrect	1 (0.8)	1 (0.7)	0 (0.0)	1 (0.9)	3 (0.6)	
I don't know	43 (33.6)	44 (32.6)	33 (26.8)	13 (11.1)	133 (26.4)	

*Pearson's chi square test and Fisher's exact test were used; p<0.05 was considered significant; Q: Question.

INFORMATION ABOUT PPE (QUESTION NO: 4-11):

Students gave correct answers to the questions about the use of PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than one meter, with a rate between 95.0% (n=478) and 82.3% (n=414). A high percentage of incorrect answers were given to questions about the use of aprons (n=44 8.7%) and medical masks (n=41 8.2%), while "don't know" answer was given to questions about the use of N95/FFP2 type masks (n=65 12.9%), goggles (n=58 11.5%) and aprons (n=45 8.9%). However, there was no statistically significant difference in the number and percentage distribution of correct, incorrect and don't know answers (p>0.05), (Table 2).

TABLE 2: Information about personal protective equipment.

	1st Grade n (%)	2nd Grade n (%)	3rd Grade n (%)	4th Grade n (%)	Total n (%)	p value*
Q4: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes GLOVES.						
Correct	123 (96.1)	127 (94.1)	116 (94.3)	112 (95.7)	478 (95.0)	0.931
Incorrect	2 (1.6)	2 (1.5)	3 (2.4)	1 (0.9)	8 (1.6)	
I don't know	3 (2.3)	6 (4.4)	4 (3.3)	4 (3.4)	17 (3.4)	
Q5: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes MEDICAL MASK (surgical mask).						
Correct	119 (93.0)	116 (85.9)	110 (89.4)	96 (82.1)	441 (87.7)	0.056
Incorrect	4 (3.1)	11 (8.1)	9 (7.3)	17 (14.5)	41 (8.2)	
I don't know	5 (3.9)	8 (5.9)	4 (3.3)	4 (3.4)	21 (4.2)	
Q6 PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes N95/FFP2 TYPE MASK *(during procedures that require intensive contact with respiratory secretions such as aspiration, bronchoscopy and bronchoscopy procedures, intubation, endoscopy, respiratory tract sampling, which cause aerosol formation).*						
Correct	106 (82.8)	112 (83.0)	107 (87.0)	111 (94.9)	436 (86.7)	0.067
Incorrect	0 (0)	1 (0.7)	1 (0.8)	0 (0)	2 (0.4)	
I don't know	22 (17.2)	22 (16.3)	15 (12.2)	6 (5.1)	65 (12.9)	
Q7: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes GOGGLES.						
Correct	106 (82.8)	110 (81.5)	99 (80.5)	102 (87.2)	417 (82.9)	0.656
Incorrect	7 (5.5)	6 (4.4)	10 (8.1)	5 (4.3)	28 (5.6)	
I don't know	15 (11.7)	19 (14.1)	14 (11.4)	13.5 (8.5)	58 (11.5)	
Q8: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes FACE PROTECTOR.						
Correct	122 (95.3)	130 (96.3)	114 (92.7)	107 (91.5)	473 (94.0)	0.434
Incorrect	0 (0)	0 (0)	2 (1.6)	2 (1.7)	4 (0.8)	
I don't know	6 (4.7)	5 (3.7)	7 (5.7)	8 (6.8)	26 (5.2)	
Q9: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes APRON *(non-sterile, preferably liquid impermeable and long sleeved).*						
Correct	112 (87.5)	113 (83.7)	93 (75.6)	96 (82.1)	414 (82.3)	0.299
Incorrect	9 (7.0)	11 (8.1)	13 (10.6)	11 (9.4)	44 (8.7)	
I don't know	7 (5.5)	11 (8.1)	17 (13.8)	10 (8.5)	45 (8.9)	
Q10: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes WATER/SOAP/ALCOHOL BASED HAND ANTISEPTIC.						
Correct	118 (92.2)	120 (88.9)	113 (91.9)	110 (94.0)	461 (91.7)	0.660
Incorrect	4 (3.1)	3 (2.2)	4 (3.3)	2 (1.7)	13 (2.6)	
I don't know	6 (4.7)	12 (8.9)	6 (4.9)	5 (4.3)	29 (5.8)	
Q11: PPE required for personnel who will come into contact with possible or definite COVID-19 cases closer than 1 meter includes COVERALLS, BONNET, FOOT PROTECTOR *(decided on a patient-by-patient basis, especially in cases where there may be intensive contact with the patient's body fluids and secretions).*						
Correct	120 (93.8)	128 (94.8)	114 (92.7)	113 (96.6)	475 (94.4)	0.778
Incorrect	2 (1.6)	1 (0.7)	1 (0.8)	0 (0)	4 (0.8)	
I don't know	6 (4.7)	6 (4.4)	8 (6.5)	4 (3.4)	24 (4.8)	

*Pearson's chi square test and Fisher's Exact Test were used; p<0.05 was considered significant; Q: Question; PPE: Personal protective equipment.

INFORMATION ABOUT THE APPROPRIATE USE OF PPE (QUESTION NO: 12-19):

When the correct answers to the questions on knowledge about the appropriate use of PPE were analyzed, it was seen that the highest percentage of correct answers were given to questions 15, 16 and 17 about the use of gloves and question 18 about the disposal of PPE (n=498 99.0%, n=475 94.4%, n=459 91.3%, n=494 98.2% respectively). For all other questions in this section (12-14, and 19), the percentage of correct answers was dramatically lower than for the other questions above (n=313 62.2%, n=250 49.7%, n=209 41.6%, n=328 65.2% respectively), but there was no statistically significant difference in the number and percentage distribution of correct, incorrect and don't know answers (p>0.05), (Table 3).

SOURCES OF INFORMATION ABOUT COVID-19

Students most frequently obtained information about protective measures to be taken during the COVID-19 pandemic from healthcare professionals, websites and scientific articles (n=273 54.3%, n=263 52.3%,

TABLE 3: Information about the appropriate use of personal protective equipment.

	1st Grade n (%)	2nd Grade n (%)	3rd Grade n (%)	4th Grade n (%)	Total n (%)	p value*
Q12: PPE should be donned in the following order: Apron, Mask, Goggles/Face protection, Gloves						
Correct	78 (60.9)	83 (61.5)	75 (61.0)	77 (65.8)	313 (62.2)	0.659
Incorrect	11 (8.6)	18 (13.3)	13 (10.6)	15 (12.8)	57 (11.3)	
I don't know	39 (30.5)	34 (25.2)	35 (28.5)	25 (21.4)	133 (26.4)	
Q13: PPE should be doffed in the following order: Gloves, Goggles/Face Protection, Apron, Mask						
Correct	61 (47.7)	60 (44.4)	61 (49.6)	68 (58.1)	250 (49.7)	0.287
Incorrect	25 (19.5)	34 (25.2)	25 (20.3)	25 (21.4)	109 (21.7)	
I don't know	42 (32.8)	41 (30.4)	37 (30.1)	24 (20.5)	144 (28.6)	
Q14: All PPE except the mask is removed before leaving the patient room. Mask is removed after leaving the patient room.						
Correct	47 (36.7)	51 (37.8)	49 (39.8)	62 (53.0)	209 (41.6)	0.187
Incorrect	33 (25.8)	31 (23.0)	28 (22.8)	21 (17.9)	113 (22.5)	
I don't know	48 (37.5)	53 (39.3)	46 (37.4)	34 (29.1)	181 (36.0)	
Q15: It is very important to use the glove correctly and to ensure hand hygiene before and after use.						
Correct	127 (99.2)	134 (99.3)	122 (99.2)	115 (98.3)	498 (99.0)	0.539
Incorrect	0 (0)	1 (0.7)	0 (0)	0 (0)	1 (0.2)	
I don't know	1 (0.8)	0 (0)	1 (0.8)	2 (1.7)	4 (0.8)	
Q16: After removing all PPE, hands should be washed with soap and water for at least 20 seconds or rubbed with alcohol-based hand sanitizer for 20-30 seconds.						
Correct	124 (96.9)	127 (94.1)	115 (93.5)	109 (93.2)	475 (94.4)	0.682
Incorrect	1 (0.8)	2 (1.5)	2 (1.6)	4 (3.4)	9 (1.8)	
I don't know	3 (2.3)	6 (4.4)	6 (4.9)	4 (3.4)	19 (3.8)	
Q17: Care should be taken not to touch the patient's environment with unchanged gloves as this will lead to contamination.						
Correct	121 (94.5)	123 (91.1)	107 (87.0)	108 (92.3)	459 (91.3)	0.378
Incorrect	0 (0)	0 (0)	1 (0.8)	1 (0.9)	2 (0.4)	
I don't know	7 (5.5)	12 (8.9)	15 (12.2)	8 (6.8)	42 (8.3)	
Q18: PPE should be personalized. The disposable material used should be disposed of in the medical waste bin.						
Correct	127 (99.2)	133 (98.5)	120 (97.6)	114 (97.4)	494 (98.2)	0.845
Incorrect	0 (0)	0 (0)	1 (0.8)	1 (0.9)	2 (0.4)	
I don't know	1 (0.8)	2 (1.5)	2 (1.6)	2 (1.7)	7 (1.4)	
Q19: The non-disposable material used can be disinfected with 70% alcohol and reused. Multi-use textile material can be washed at 60-90 degrees and reused.						
Correct	75 (58.6)	89 (65.9)	77 (62.6)	87 (74.4)	328 (65.2)	0.100
Incorrect	11 (8.6)	15 (11.1)	8 (6.5)	8 (6.8)	42 (8.3)	
I don't know	42 (32.8)	31 (23.0)	38 (30.9)	22 (18.8)	133 (26.4)	

*Pearson's chi square test and Fisher's exact test were used; p<0.05 was considered significant; Q: Question; PPE: Personal protective equipment.

TABLE 4: Sources of information about COVID-19.

	1st Grade n (%)	2nd Grade n (%)	3rd Grade n (%)	4th Grade n (%)	Total n (%)	p value*
From which source do you usually try to access information about protective measures to be taken during the COVID-19 pandemic?						
TV	25 (19.5)	17 (12.6)	17 (13.8)	12 (10.3)	71 (14.1)	0.124
Radio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
Web	66 (51.6)	66 (48.9)	69 (56.1)	62 (53.0)	263 (52.3)	
Printed publications (Newspapers and magazines, etc.)	3 (2.3)	4 (3.0)	4 (3.3)	5 (4.3)	16 (3.2)	
Social Media	34 (26.6)	48 (35.6)	33 (26.8)	35 (29.9)	150 (29.8)	
Other	0 (0)	0 (0)	0 (0)	3 (2.6)	3 (0.6)	
Clinical guidelines	33 (25.8)	31 (23.0)	29 (23.6)	24 (20.5)	117 (23.3)	0.789
Scientific articles	46 (35.9)	49 (36.3)	52 (42.3)	50 (42.7)	197 (39.2)	
Brochures	7 (5.5)	6 (4.4)	6 (4.9)	2 (1.7)	21 (4.2)	
Banners, Signboards, Boards	28 (21.9)	37 (27.4)	24 (19.5)	28 (23.9)	117 (23.3)	
Personal blog pages	13 (10.2)	12 (8.9)	12 (9.8)	11 (9.4)	48 (9.5)	
Other	1 (0.8)	0 (0)	0 (0)	0 (0)	2 (1.7)	
Friends	12 (9.4)	30 (22.2)	29 (23.6)	21 (17.9)	92 (18.3)	0.216
Family	38 (29.7)	36 (26.7)	29 (23.6)	27 (23.1)	130 (25.8)	
Health workers	74 (57.8)	68 (50.4)	64 (52.0)	67 (57.3)	273 (54.3)	
Social media influencers	3 (2.3)	1 (0.7)	1 (0.8)	2 (1.7)	7 (1.4)	
Other	1 (0.8)	0 (0)	0 (0)	0 (0)	1 (0.2)	
When you consider the sources of information about protective measures against COVID-19 infection, which of the following is **the most important factor that makes it easier** for you to choose between sources of information?						
Easy accessibility	37 (28.9)	31 (23.0)	30 (24.4)	40 (34.2)	138 (27.4)	0.662
Reliable as a source of information	51 (39.8)	64 (47.4)	54 (43.9)	45 (38.5)	214 (42.5)	
Frequently updated information	31 (24.2)	27 (20.0)	26 (21.1)	18 (15.4)	102 (20.3)	
Including correct and incorrect practices by comparing them	5 (3.9)	10 (7.4)	8 (6.5)	9 (7.7)	32 (6.4)	
Including the use of video/photo/diagram	3 (2.3)	3 (2.2)	5 (4.1)	4 (3.4)	15 (3.0)	
Other	1 (0.8)	0 (0)	0 (0)	1 (0.9)	2 (0.4)	
In which time period did you most often choose to learn about protective measures against COVID-19 infection?						
Weekdays, 06:00-12:00	3 (2.3)	6 (4.4)	2 (1.6)	4 (3.4)	15 (3.0)	0.759
Weekdays, 12:00-18:00	27 (21.1)	30 (22.2)	26 (21.1)	18 (15.4)	101 (20.1)	
Weekdays, 18:00-24:00	51 (39.8)	53 (39.3)	52 (42.3)	48 (41.0)	204 (40.6)	
Weekdays, 24:00-06:00	5 (3.9)	4 (3.0)	2 (1.6)	2 (1.7)	13 (2.6)	
Weekend, 06:00-12:00	2 (1.6)	6 (4.4)	3 (2.4)	1 (0.9)	12 (2.4)	
Weekend, 12:00-18:00	14 (10.9)	11 (8.1)	11 (8.9)	18 (15.4)	54 (10.7)	
Weekend, 18:00-24:00	24 (18.8)	25 (18.5)	24 (19.5)	24 (20.5)	97 (19.3)	
Weekend, 24:00-06:00	2 (1.6)	0 (0)	3 (2.4)	2 (1.7)	7 (1.4)	

*Pearson's chi square test and Fisher's exact test were used; p<0.05 was considered significant; Q: Question.

n=197 39.2%, respectively). The most important factor that facilitated the students' choice among the sources of information was the reliability of the source of information (n=214 42.5%), while the second most important factor was the easy accessibility of the source of information (n=138 27.4%). And they most frequently tried to access the source of information between 18:00-24:00 on weekdays (n=204 40.6%) (Table 4).

DISCUSSION

This study provided information on the level of knowledge of physiotherapy students in Türkiye about preventive measures for transmission, such as isolation methods and PPE, which should be followed when faced with possible and definite COVID-19 cases. Although an online form was used, the number of physiotherapy students participating in the study

was higher than similar studies in the literature. Our study revealed that students who were interns and prospective healthcare workers had knowledge about contact and droplet isolation methods in probable and definite cases, while they had less knowledge about respiratory isolation methods in patients receiving respiratory support. An important result that we obtained from the study was that the students had knowledge about PPEs, but the order of donning and doffing them and the disinfection and reuse of non-disposable materials were not known by most of the students. When the ways of obtaining information about COVID-19 were examined; it was found that information was frequently acquired from healthcare professionals, websites and scientific articles. Reliability and easy accessibility were the prominent reasons for choosing the source. And they tried to access information sources most frequently between 18:00-24:00 on weekdays.

INFORMATION ABOUT METHODS OF ISOLATION

In our study, 91.3% of the 503 participant students were aware that standard, contact and droplet isolation measures should be taken in probable and definite cases until COVID-19 infection is excluded or the treatment process is completed. Jangra et al. also reported that 91.0% of students were aware of both good respiratory hygiene practices and the fight against COVID-19 infection in their study with 203 physiotherapy students.[13]

A study of healthcare professionals and students from the Mumbai Metropolitan Region found that awareness of various infection control measures such as respiratory hygiene and cough etiquette in the healthcare setting and having a separate, well-ventilated waiting area for suspected COVID-19 patients was adequate, with an overall correct response rate of 71.2%.[14] Krishnan evaluated the knowledge about COVID-19 and physiotherapy awareness of 159 physiotherapy students in his study. Although the questions asked to the students in this study are not very similar to our study, the answers given to some questions support the results of our study. In this study, students correctly (90% or more) knew that the COVID-19 virus spreads through droplets and that isolation measures should be taken.[15] Mudenda et al. also found that health students (478 health students) generally had good knowledge of COVID-19.[16] In a study conducted in Türkiye, the level of knowledge and risk perception of health students about COVID-19 were evaluated. In this study, similar to the literature, it was observed that students were highly aware that the infection is transmitted through respiratory droplets and that contact precautions should be taken.[17]

In our study, unlike the studies we encountered in the literature, we asked the question "respiratory isolation measures should be followed" as a precautionary measure in patients under noninvasive or invasive respiratory support treatment. The rate of correct answers to this question (73.0%) was slightly low. While our students had a good level of knowledge about the situations requiring contact and droplet isolation, they knew less about the situations requiring respiratory isolation. 2nd and 3rd grade students can work in hospitals as interns and they can even be in intensive care units. Therefore, we think it is important for them to know the conditions requiring respiratory isolation. This new data we obtained as a result of our study may be useful when planning the topics of future trainings or seminars.

INFORMATION ABOUT PPE

In the literature, we observe that the knowledge of health students about the use of protective equipment, especially the use of gloves, masks, regular hand washing and disinfection, is questioned. And these studies report that students have a high awareness of these issues and have a good level of knowledge. However, it was emphasized that students should be informed about different types of face masks.[16,18-22]

In our study, unlike the studies mentioned above due to its methodology, students' knowledge about other protective equipment such as aprons, face shields, gowns, coveralls, bonnets and foot protectors were also questioned. We found that students had similarly adequate knowledge about this equipment. However, our students did not have sufficient knowledge about the appropriate use of these equipment.

INFORMATION ABOUT THE METHODS OF USE OF PPE

From our study, we concluded that our students do not have sufficient knowledge about the appropriate

use of PPE. As authors, we believe that this result is one of the most important findings of our study. The rate of students who knew the order of donning and doffing of gloves, goggles/face protection, apron and mask, the fact that all PPEs except the mask should be removed before leaving the patient room and the mask should be removed after leaving the patient room, and that non-disposable materials can be reused by disinfecting or washing were low. During physiotherapy interventionsit is imperative to take precautions to prevent contamination. It is recommended that physiotherapists are trained in the correct donning and doffing of PPE and that a record is kept of staff who have completed PPE training and compliance checks.[7]

Although students are not actively involved in physiotherapy services, they may come into contact with patients in a healthcare setting. Therefore, they may become infected and/or spread the infection. It is also worrying that 4th grade students, who are in their final year of graduation, gave a similarly low percentage of correct answers as students in other grades. In the global crisis caused by the COVID-19 pandemic, it is known that states have offered to temporarily allow final year medical students to treat patients. It remains to be seen whether similar offers will be made in other disciplines in the future. Some of the students in our study have graduated, but the reporting of new COVID-19 cases around the world has not stopped. The WHO (from 24 July to 20 August 2023) reported nearly 1.5 million new COVID-19 cases and more than 2000 deaths.[23] For this reason, it seems to be a necessity for all students, especially senior students, to know not only what PPEs are but also their appropriate use, which should be used to prevent infection transmission before internship and graduation.

SOURCES OF INFORMATION ABOUT COVID-19

Students most frequently obtained information about the protective measures to be taken during the COVID-19 pandemic from healthcare professionals (54.3%) and the internet (52.3%). There were also those who received information from scientific literature (39.2%) and social media (29.8%). A study from Türkiye reported that the majority of physiotherapy and rehabilitation students learned about COVID-19 through social media.[18] Another study, which included students from fields such as medicine, dentistry and physiotherapy, similarly reported that the majority of students (65.1%) obtained information from social media.[24]

In our study, unlike these two studies, fewer number of physiotherapy students reported to obtain information from social media. This might be due to the fact that our students do not find social media reliable. Although we did not ask the students whether they trusted social media, the majority of the students answered that the most important factor that made it easier for them to choose between the sources of information was the reliability of the information source. Although our study and the other two studies present different findings, the common point of all three studies is that the internet environment has an active role in student learning processes. This underlines the importance of using the internet and social media correctly and effectively during pandemic periods. Another information we learned from our study was that students accessed the information source most frequently between 18:00-24:00 on weekdays. This information may be helpful in terms of increasing the number of participants in future seminars or trainings using the internet and social media.

We did not use a survey for which validity and reliability studies had been conducted in our study, because we could not find a survey in the literature that included all the questions for our research purpose in studies similar to ours. This can be considered a limitation of our study.

CONCLUSION

Our study cannot be generalized to all physiotherapy students, but it has revealed certain deficiencies in physiotherapy students, a group of students who may come into close contact with COVID-19 cases. The COVID-19 pandemic appears to have lost its topicality among research topics. However, it should be noted that pandemics have occurred throughout history and are inevitable in the future. Physiotherapists and physiotherapy students can play important roles

in future pandemics, just as they did in the COVID-19 pandemic. In this process, there is still a need for new data to be taken for certain steps to be taken for the continuous development of basic knowledge and skills as well as clinical skills. Therefore, we believe that our study maintains its importance with the results it presents, which differ from the literature, and can serve as a guide in creating educational content.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Hayriye Kul Karaali, Özlem Özcan;* ***Design:*** *Hayriye Kul Karaali, Özlem Özcan;* ***Control/Supervision:*** *Hayriye Kul Karaali, Özlem Özcan;* ***Data Collection and/or Processing:*** *Hayriye Kul Karaali, Özlem Özcan;* ***Analysis and/or Interpretation:*** *Hayriye Kul Karaali;* ***Literature Review:*** *Hayriye Kul Karaali, Özlem Özcan;* ***Writing the Article:*** *Hayriye Kul Karaali, Özlem Özcan;* ***Critical Review:*** *Hayriye Kul Karaali, Özlem Özcan.*

REFERENCES

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta Biomed. 2020;91(1):157-60. [PubMed] [PMC]
2. Physiopedia [Internet]. © Physiopedia 2023 [Cited: June 13, 2023]. Infection prevention and control. Available from: [Link]
3. WHO [Internet]. © 2023 WHO [Cited: May 28, 2023]. Infection prevention and control. Available from: [Link]
4. Sharma A, Ahmad Farouk I, Lal SK. COVID-19: a review on the novel coronavirus disease evolution, transmission, detection, control and prevention. Viruses. 2021;13(2):202. [Crossref] [PubMed] [PMC]
5. Wang Y, Wang Y, Chen Y, Qin Q. Unique epidemiological and clinical features of the emerging 2019 novel coronavirus pneumonia (COVID-19) implicate special control measures. J Med Virol. 2020;92(6):568-76. [Crossref] [PubMed] [PMC]
6. Jara BJ. Infection prevention in the era of COVID-19: 2021 basic procedure review. J Nucl Med Technol. 2021;49(2):126-31. [Crossref] [PubMed] [PMC]
7. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. J Physiother. 2020;66(2):73-82. [Crossref] [PubMed] [PMC]
8. Smondack P, Gravier FÉ, Prieur G, Repel A, Muir JF, Cuvelier A, et al. Kinésithérapie et COVID-19 : de la réanimation à la réhabilitation à domicile. Synthèse des recommandations internationales [Physiotherapy and COVID-19. From intensive care unit to home care-An overview of international guidelines]. Rev Mal Respir. 2020;37(10):811-22. French. [Crossref] [PubMed] [PMC]
9. Udina C, Ars J, Morandi A, Vilaró J, Cáceres C, Inzitari M. Rehabilitation in adult post-COVID-19 patients in post-acute care with Therapeutic Exercise. J Frailty Aging. 2021;10(3):297-300. [Crossref] [PubMed] [PMC]
10. Physiopedia [Internet]. © Physiopedia 2023 [Cited: April 15, 2023]. Personal protective equipment. Available from: [Link]
11. APTA [Internet]. [Cited: April 15, 2023]. Coronavirus (COVID-19) resources for the physical therapy profession. Available from: [Link]
12. T.C. Sağlık Bakanlığı [İnternet]. © 2024 T.C. Sağlık Bakanlığı [Erişim tarihi: 03 Ocak 2021]. Günlük COVID-19 Aşı Tablosu. Erişim linki: [Link]
13. Jangra MK, Saxena A, Anurag P. Knowledge and awareness among physiotherapy students to combat COVID-19: a questionnaire based study. Clin Epidemiol Glob Health. 2021;11:100748. [Crossref] [PubMed] [PMC]
14. Modi PD, Nair G, Uppe A, Modi J, Tuppekar B, Gharpure AS, et al. COVID-19 awareness among healthcare students and professionals in mumbai metropolitan region: a questionnaire-based survey. Cureus. 2020;12(4):e7514. [Crossref] [PubMed] [PMC]
15. Krishnan P, Krishnan K, Chan WK. Knowledge of COVID-19 and awareness of physiotherapy rehabilitation among clinical physiotherapy students: a cross-sectional study. Malays J Med Sci. 2022;29(6):115-22. [Crossref] [PubMed] [PMC]
16. Mudenda S, Ngalande N, Mukosha M, Hikaambo CN, Daka V, Matafwali SK, et al. Knowledge and practices toward COVID-19 among healthcare students: a cross-sectional study at the University of Zambia. Front Public Health. 2022;10:1028312. [Crossref] [PubMed] [PMC]
17. Cihan E, Şahbaz Pirinççi C, Gerçek H, Ünüvar BS, Demirdel E. The knowledge levels, preventive behavior and risk perception on COVID-19 of the healthcare students in Turkey. Suleyman Demirel University The Journal of Health Science. 2020;11(3):342-7. [Link]
18. Tonak HA, Kitis A. A descriptive study of knowledge, attitudes, behaviors, and precautions of physiotherapy and rehabilitation students regarding COVID-19. Work. 2022;72(3):787-96. [Crossref] [PubMed]
19. Hatami H, Abbasi-Kangevari M, Malekpour MR, Kolahi AA. Knowledge, attitudes, and safety practices about COVID-19 among high school students in Iran during the first wave of the pandemic. Front Public Health. 2021;9:680514. [Crossref] [PubMed] [PMC]
20. Şen S, Aydın Ç, Bayraktar HN, Demir S. Sağlık bilimleri fakültesi öğrencilerinin COVID-19'a ilişkin bilgi, tutum, uygulamalarini etkileyen etmenlerin incelenmesi [Investigation of knowledge, attitude, practice, and affecting factors of health sciences students on COVID-19]. Journal of Health and Nursing Management. 2022;9(1):79-88 doi: 10.54304/SHYD.2022.52386 [Crossref]

21. Olum R, Kajjimu J, Kanyike AM, Chekwech G, Wekha G, Nassozi DR, et al. Perspective of medical students on the COVID-19 pandemic: survey of nine medical schools in Uganda. JMIR Public Health Surveill. 2020;6(2):e19847. [Crossref] [PubMed] [PMC]

22. Maheshwari S, Gupta P, Sinha R, Rawat P. Knowledge, attitude, and practice towards coronavirus disease 2019 (COVID-19) among medical students: a cross-sectional study. Journal of Acute Disease. 2020;9(3):100-4. [Crossref]

23. COVID-19 information platform [Internet]. Weekly epidemiological update on COVID-19 - 25 August 2023. [Accessed: July 10, 2024]. Access link: [Link]

24. Gohel KH, Patel PB, Shah PM, Patel JR, Pandit N, Raut A. Knowledge and perceptions about COVID-19 among the medical and allied health science students in India: an online cross-sectional survey. Clin Epidemiol Glob Health. 2021;9:104-9. [Crossref] [PubMed] [PMC]