

EVALUATION OF HEALTH TECHNICIAN STUDENTS' KNOWLEDGE AND BEHAVIORS REGARDING COVID-19 AND PROTECTIVE MEASURES

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Received: 20.10.2022; **Accepted:** 02.11.2022; **Available Online Date:** 31.01.2023

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Cite this article as: Guldass N, Acikgoz A, Evaluation of Health Technician Students' Knowledge and Behaviors Regarding COVID-19 and Protective Measures. J Basic Clin Health Sci 2023; 7: 479-491.

ABSTRACT

Purpose: COVID-19 is an important public health problem impacting the whole world. This study aimed to evaluate health technician students' knowledge and behaviors regarding COVID-19 and protective measures.

Material and Methods: This cross-sectional study was performed with Dokuz Eylül University Vocational School of Health Services students (n=648). Data were collected online using a descriptive data registration form that consisted of 65 questions via Google Forms.

Results While the students' mean knowledge score on COVID-19 and protective measures was 15.31 ± 3.22 , the mean behavior score was 10.53 ± 3.34 . A significant difference was detected between the students' education program, gender, father's educational status, smoking, and exercise habits and total behavior score averages related to COVID-19 and protective measures ($p < 0.05$). Students who received training on the prevention of infectious diseases during their student years and who stated that they received any training on COVID-19 had higher mean knowledge and behavior scores regarding protective measures against COVID-19 ($p < 0.05$). Students who were afraid of being infected with COVID-19, who had had COVID-19, and whose relatives died due to COVID-19 had higher mean behavior scores regarding protective measures against COVID-19 ($p < 0.05$).

Conclusion: It was revealed that the students participating in the study had moderate knowledge about COVID-19 and protective measures and exhibited positive behavior regarding protective measures. Since increasing the knowledge levels of future health technicians will also be reflected in their protective behaviors, which are important for their professional life, it is recommended that necessary arrangements be made in the education curriculum to improve their knowledge and behavior.

Keywords: COVID-19, knowledge, behavior, health technician student

INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by the SARS-CoV-2 virus, first emerged in the Wuhan region of China in December 2019 and has become a public health problem impacting all humanity (1). The World Health Organization (WHO) declared the COVID-19 outbreak, which spread rapidly all over the

world, a pandemic on March 11, 2020, due to causing thousands of deaths and a high infection rate (2). Although SARS-CoV-2 is genomically similar to other members of the coronavirus family, such as the SARS-CoV and MERS-CoV virus, which have caused epidemics in various countries around the

world in the last 20 years, it is distinguished from them since it is more contagious and has low pathogenicity (3).

The COVID-19 pandemic has shown its effect in Turkey with the detection of the first case in our country on March 9, 2020 (4). SARS-CoV-2 can be transmitted directly between people through the droplets of respiratory secretions that occur during talking, coughing, and sneezing and can also be transmitted indirectly through contact with contaminated surfaces (5,6).

The incubation period of the disease is 1-14 days (7). Its symptoms are mainly fever, dry cough, and fatigue (8,9). The elderly and individuals with chronic diseases are at high risk for COVID-19. Vaccination, hand hygiene, covering the mouth and nose when coughing and sneezing, using a mask, paying attention to a one-meter social distance, and not being in crowded and closed places are important among the standard measures in protection against the disease (10,11).

Healthcare workers are always at risk for infectious diseases. This risk increases even more considering that COVID-19 is transmitted even from asymptomatic individuals (5,12). Healthcare workers, who are at the forefront of the fight against this highly contagious disease, are directly or indirectly impacted by it. During the COVID-19 pandemic, a lot of healthcare workers have been infected and even died worldwide (13-17).

Conscious and well-trained healthcare workers are of vital importance in the fight against the pandemic. Health technician students are healthcare worker candidates. The lack of knowledge of these students about COVID-19 causes them to be infected and infect their environment, increasing their stress while preventing them from working in a healthy manner. As future healthcare professionals, these students, who will have the power to influence the health of society, can affect the disease's spread rate and death rate, especially with their knowledge about the disease, the way of transmission, clinical findings, and prevention. They will also play a very valuable role in providing health education in the community, disseminating reliable information about COVID-19, and risk prevention. Hence, they should have knowledge about COVID-19 and know the correct and reliable sources from which they can access information and the necessary measures to control the disease. Thus, they can be a source of health awareness and health education for society. It is

important to identify the knowledge levels of these students studying in the field of health about COVID-19 and protective measures and evaluate their behaviors, increase awareness of this issue, eliminate the lack of knowledge, and make the necessary arrangements for behavior change. This study aimed to evaluate health technician students' knowledge and behaviors regarding COVID-19 and protective measures.

MATERIAL AND METHODS

Study population and sample:

This cross-sectional study was performed with students in all programs of Dokuz Eylül University Vocational School of Health Services (VSHS) (Anesthesia, Oral and Dental Health, Medical Documentation and Secretariat, Medical Imaging, Medical Laboratory Techniques, First and Emergency Aid, Audiometry, Radiotherapy and Nuclear Medicine Technician). The study population consists of students (N=1492) studying at the VSHS in the spring semester of the 2021-2022 academic year. This study aimed to reach the entire population without sample selection. A total of 648 health technician students participated in our study.

Data collection tool

The Descriptive Data Registration Form consisting of 65 questions was used as a data collection tool. This form includes questions to evaluate the sociodemographic, individual, and familial characteristics of students, their status of receiving education on COVID-19, their history of having COVID-19 and vaccination, their knowledge of COVID-19 and protective measures, and their behavior regarding protection against COVID-19. The researchers created the form using the literature. For a pilot study of the questionnaire, it was ensured that 10 randomly selected students filled out the questionnaire, and the final version was created by assessing the comprehensibility of the questionnaire. Students' knowledge and behavior scores regarding COVID-19 and protective measures are the dependent variables of the study. Twenty-seven questions were asked to determine students' levels of knowledge, and 14 questions were asked to evaluate their behavior. Twelve of the knowledge questions (questions 1, 4, 11, 14, 18, 21, 22, 23, 24, 25, 26, and 27) consist of false propositions. Students who answered the questions correctly received '1' point, and those who gave wrong answers received '0'

points. The scores that can be obtained from the knowledge questions vary between 0-27, and the level of knowledge about COVID-19 increases with the increasing score. Students who answered "Yes" to the behavior propositions received '1' point, and those who answered "No" received '0' points. The scores that can be obtained from the behavior propositions vary between 0-14, and high scores mean that the behavior related to COVID-19 is positive. Knowledge and behavior scores were summed and averaged.

The independent variables of the study are the student's education program, grade, age, gender, place of stay, educational status of the father and mother, the presence of healthcare workers in the family, the presence of chronic diseases, smoking habit, exercising regularly, prevention of infectious diseases and status of receiving training on COVID-19, knowledge about COVID-19, source of information, fear of being infected with COVID-19, having undergone a polymerase chain reaction (PCR) test, a history of contact with a COVID-19 positive patient and having the disease, the presence of COVID-19 positive relatives and relatives who died of COVID-19, and a history of vaccination against COVID-19. Being diagnosed by a physician was taken as a basis for the presence of chronic disease. Students' knowledge level competencies about COVID-19 were evaluated according to their perceptions.

Data Collection

Since students were receiving hybrid education due to the COVID-19 pandemic, the research data were collected using an online questionnaire via Google Forms. The questionnaires were created in the electronic environment with Google Drive's online service system (<https://docs.google.com/forms/d/182GBbeYMPcMn eCZmEU3dOwbX5dzbsDH2DFImg-0dtvY/edit>). The questionnaire created in the electronic environment was shared in the students' WhatsApp groups. Students who voluntarily agreed to participate in the study were included in the study, whereas those who did not agree to participate in the study and those who did not answer all the questions in the questionnaire were excluded from the study. No guiding intervention was applied to the participants while they were filling out the questionnaires. Students filled out the questionnaire online between May 13-June 23, 2022.

Research Ethics

Written permission was obtained from the administration of the VSHS to carry out this study. This study was conducted following the principles of the World Medical Association Helsinki Declaration. Ethics approval was obtained from Dokuz Eylül University Non-Interventional Ethics Committee (Date: 11.05.2022, No: 2022/17-16). All students were informed about the study's purpose before their participation in the study. The consent form on the first page of the questionnaire contained information about the study and the assurance that the student had the right to refuse to participate in the study and all the information provided would be kept confidential. Online written consent was obtained from all participants before answering the questions. Google Forms has privacy principles such as protecting data and not using it outside members, not sharing data, and never selling personal information to anyone. In our study, the questionnaires were created anonymously, and the students' personal information was not requested.

Statistical analysis

Statistical analysis was conducted using the SPSS 24.0 statistical package program. Descriptive data were presented as mean, standard deviation, number and percentage. The Kolmogorov-Smirnov tests of normality were used to determine whether the data were normally distributed. Since the data were not normally distributed ($p < 0.05$), non-parametric tests (Kruskal-Wallis analysis of variance, Mann-Whitney U test, and Spearman's correlation analysis) were used in the analyses. When a significant difference was revealed between the group means with the analysis of variance, the "Bonferroni" corrected Mann-Whitney U test, one of the 'post hoc' analysis methods, was used. The statistical significance level was accepted as $p < 0.05$.

RESULTS

Six hundred forty-eight health technician students participated in the study. The age of students varied between 18 and 31, and the mean age was 20.4 ± 1.8 (min:18, max:31). Of the students constituting the study group, 169 (26.1%) were male, 479 (73.9%) were female, and 50.9% were studying in the first grade. Table 1 contains the sociodemographic characteristics of students.

Table 1. Students' sociodemographic characteristics (n=648)

Characteristics	n	%	
Program*	ODH	70	10.8
	MDS	113	17.4
	MIT	31	4.8
	MLT	110	17.0
	RIT	111	17.1
	FEA	61	9.4
	ANS	39	6.0
	NMT	40	6.2
	ADY	73	11.3
	Grade	First	330
Second		318	49.1
Gender	Male	169	26.1
	Female	479	73.9
Age group (Mean: 20.4±1.8, Min:18; Max:31)	≤20	397	61.3
	≥21	251	38.7
Father's educational status	Illiterate	9	1.4
	Literate	20	3.1
	Primary school	189	29.2
	Secondary school	161	24.8
	High school	199	30.7
	University	70	10.8
Mother's educational status	Illiterate	56	8.6
	Literate	43	6.6
	Primary school	254	39.2
	Secondary school	140	21.6
	High school	117	18.1
	University	38	5.9
Place of stay	With the family	242	37.3
	At home with a friend	108	16.7
	Alone at home	49	7.6
	In the dormitory	249	38.4
The presence of healthcare workers in the family	No	548	84.6
	Yes	100	15.4
Diagnosed chronic disease	No	594	91.7
	Yes	54	8.3
Smoking	Non-smoker	434	67.0
	Quitted	13	2.0
	Smoking at least 1 cigarette a day	102	15.7
	Occasional smoker	99	15.3
Regular exercise	Exercising	163	25.2
	Not exercising	485	74.8

* Anesthesia (ANS), Oral and Dental Health (ODH), Medical Documentation and Secretariat (MDS), Medical Imaging Techniques (MIT), Medical Laboratory Techniques (MLT), First and Emergency Aid (FEA), Audiometry (ADY), Radiotherapy (RIT), and Nuclear Medicine Technician (NMT)

In this study, while the knowledge question about COVID-19 answered correctly at the highest percentage of 96.9% was "The main transmission route of COVID-19 is the respiratory route and close contact," the questions answered incorrectly at the highest percentages were "If COVID-19 patients do

not have a fever, they will not transmit the disease to others" at 85.8% and "There is no need to follow social distancing rules in the open area to ensure protection from COVID-19" and "Children and adolescents do not have to comply with preventive measures for COVID-19" at 85.5%. Table 2 shows

Table 2. Distribution of students' answers to the knowledge questions about COVID-19 disease

Knowledge Questions	Correct		Incorrect		I do not know	
	n	%	n	%	n	%
1. COVID-19 is a bacterial infection.	271	41.8	267	41.2	110	17
2. The main transmission route of COVID-19 is the respiratory route and close contact.	626	96.9	10	1.5	12	1.9
3. Young people with asymptomatic COVID-19 infection are usually a source of transmission for the elderly.	519	80.1	68	10.5	61	9.4
4. If COVID-19 patients do not have a fever, they will not transmit the disease to others.	21	3.2	556	85.8	71	11
5. Speaking loudly and singing indoors are high-risk behaviors for the transmission of COVID-19.	350	54.0	203	31.3	95	14.7
6. Covering the mouth and nose while coughing and sneezing prevents the spread of the disease.	402	62	134	20.7	112	17.3
7. Smoking is a risk factor for the transmission of COVID-19 infection.	592	91.4	20	3.1	36	5.6
8. The incubation period of COVID-19 infection is 5-14 days.	576	88.9	29	4.5	43	6.6
9. Fever and dry cough are the most common symptoms of COVID-19.	619	95.5	14	2.2	15	2.3
10. Chronic diseases and old age adversely impact the course of the disease.	83	12.8	492	75.9	73	11.3
11. Young people and children have the disease completely without any symptoms.	507	78.2	18	2.8	123	19
12. The symptoms of COVID-19 infections with the Omicron variant are similar to those of the common cold and flu.	264	40.7	77	11.9	307	47.4
13. COVID-19 disease has a more severe course in pregnant women.	59	9.1	441	68.1	148	22.8
14. Reported deaths are usually children and young adults.	526	81.2	58	9.0	64	9.9
15. The COVID-19 vaccine reduces the risk of hospitalization in intensive care units.	463	71.5	78	12	107	16.5
16. People who have been vaccinated against COVID-19 can have the disease asymptotically and transmit the disease.	590	91.0	23	3.5	35	5.4
17. The diagnosis of the disease is established by a PCR test on respiratory tract samples.	201	31	258	39.8	189	29.2
18. Antibiotics are effective in the prevention and treatment of the disease.	598	92.3	17	2.6	33	5.1
19. Hands should be washed or cleaned with a hand antiseptic before and after changing the mask.	232	35.8	178	27.5	238	36.7
20. The presence of a beard reduces the protective effect of the mask.	515	79.5	39	6.0	94	14.5
21. Non-medical fabric masks are insufficient in preventing disease transmission.	131	20.2	416	64.2	101	15.6
22. Gloves should be preferred instead of washing hands frequently.	116	17.9	322	49.7	210	32.4
23. The influenza vaccine also has a protective effect against COVID-19 disease.	456	70.4	71	11	121	18.7
24. Antiseptic-containing soap should be used instead of normal soap for protection against COVID-19.	72	11.1	479	73.9	97	15.0
25. People who have had the disease do not need to be vaccinated.	83	12.8	511	78.9	54	8.3
26. There is no need to follow social distancing rules in the open area to ensure protection against COVID-19.	51	7.9	554	85.5	43	6.6
27. Children and adolescents do not have to comply with preventive measures for COVID-19.	51	7.9	554	85.5	43	6.6

the distribution of the students' answers to the knowledge questions about COVID-19 and protective measures.

While the students' mean knowledge scores about COVID-19 and protective measures were 15.31±3.22, their mean behavior scores were 10.53±3.34. There was a weak positive correlation between the scores the students received from the knowledge questions about COVID-19 and protective measures and the scores they received from the behavior propositions (r=0.21, p<0.001).

Table 3 contains the distribution of the students' responses to the attitude and behavior propositions regarding COVID-19 and protective measures.

Table 4 shows the distribution of the knowledge scores and the scores students received from behavior propositions regarding COVID-19 and protective measures according to sociodemographic characteristics. No significant correlation was found between the sociodemographic characteristics of students and their mean knowledge scores about COVID-19 and protective measures (p>0.05). A significant difference was detected between the students' education program, gender, father's educational status, smoking, and exercise habit and their total behavior score averages regarding COVID-19 and protective measures (p<0.05). Anesthesia technician students had significantly higher total

behavior score averages regarding COVID-19 and protective measures than Oral and Dental Health, Medical Documentation and Secretariat, Medical Imaging, Medical Laboratory, First and Emergency Aid, Audiometry, and Nuclear Medicine Technician students ($p < 0.05$). The total behavior score averages regarding COVID-19 and protective measures were higher in female students than male students and those who exercised regularly than those who did not

Table 3. Distribution of students' responses to attitude and behavior propositions regarding COVID-19 disease

Due to COVID-19	Yes		No	
	n	%	n	%
I reduced the use of public transportation.	298	46	350	54
I went shopping less frequently.	471	72.7	177	27.3
I went less to places such as libraries, theaters, cinemas, and cafes.	504	77.8	144	22.2
I washed my hands more often than normal.	599	92.4	49	7.6
I pay attention to the social distance of at least one-meter when I am with other people.	475	73.3	173	26.7
I avoid shaking hands when greeting others.	482	74.4	166	25.6
I avoid touching my face and mask.	508	78.1	142	21.9
I pay more attention to covering my mouth and nose when coughing or sneezing.	615	94.9	33	5.1
I closely monitor the COVID-19 symptoms of the people around me.	476	73.5	172	26.5
I pay attention to following a balanced diet.	401	61.9	247	38.1
I clean my personal belongings (e.g., phone) after using them in public areas where other people are present.	510	78.7	138	21.3
I pay attention to sleeping for a sufficient time (8 hours of sleep).	376	58	272	42
I wear a mask in crowded places.	571	88.1	77	11.9
I encourage people around me to comply with COVID-19 precautions.	538	83	110	17

($p < 0.05$). The protective behaviors of students who did not smoke were significantly higher than occasional smokers ($p < 0.001$). The protective behaviors of students whose fathers were secondary school graduates were significantly higher compared to those whose fathers had primary school and below education ($p < 0.001$, Table 4).

Of the students, 64.4% reported that they received training on the prevention of infectious diseases during their student years, and 49.8% stated that they received training on COVID-19. Of the students in the study group, 68.2% stated that their level of knowledge about COVID-19 was good, and 98.1% said that they were vaccinated against COVID-19. Of those vaccinated, 17.6% ($n=114$) were vaccinated with Sinovac (16 people 1 dose, 74 people 2 doses, 21 people 3 doses, 3 people 4 doses), 94.4% ($n=556$) with BioNTech (68 people 1 dose, 299 people 2 doses, 213 people 3 doses, 5 people 4 doses, 1 person 5 doses), and 0.8% ($n=5$) with TURKOVAC (3 people 1 dose, 1 person 2 doses, 1 person 3 doses) (Table 5).

Students who received training on the prevention of infectious diseases during their student years and who stated that they received any training on COVID-19 had significantly higher mean knowledge and behavior scores regarding protective measures against COVID-19 than those who did not receive training ($p < 0.01$). Students who answered the question, "How much do you know about COVID-19, in your opinion?" as "none/very little/little" had lower mean COVID-19 knowledge and protective behavior scores than those whose answer was "good and very good" ($p < 0.01$). The mean COVID-19 knowledge and protective behavior scores of students indicating their knowledge about COVID-19 as "good" were lower in comparison with those who indicated their knowledge as "very good" ($p < 0.002$, Table 6).

Students answered the question, "What is your source of information about COVID-19?" as social media at most (75.6%) and as other sources such as school and health personnel at least (2.0%) (Table 5). The mean knowledge scores regarding protective measures against COVID-19 of students who indicated the websites of the World Health Organization, the Ministry of Health, and hospitals and TV discussion programs/news as the sources of information were significantly higher compared to those who did not use these fields ($p < 0.01$). The mean behavior scores regarding protective measures against COVID-19 of students who indicated social

Table 4. The relationship between students' sociodemographic characteristics and their knowledge and behavior regarding COVID-19 and protective measures

Characteristics		n (%)	Knowledge Score Mean±SD	p	Behavior Mean±SD	p
Program***	ODH	70 (10.8)	15.59±3.42	0.685*	10.24±3.88	0.012*
	MDS	113 (17.4)	15.22±3.98		10.69±3.29	
	MIT	31 (4.8)	15.26±2.62		10.39±3.74	
	MLT	110 (17.0)	15.25±2.89		10.08±3.06	
	RIT	111 (17.1)	15.21±3.13		10.95±3.74	
	FEA	61 (9.4)	15.77±2.81		10.38±3.45	
	ANS	39 (6.0)	15.28±3.35		11.82±2.07†	
	NMT	40 (6.2)	15.63±2.61		10.15±2.98	
ADY	73 (11.3)	14.88±3.20	10.27±2.93			
Grade	First	330 (50.9)	15.25±3.31	0.847**	10.63±3.25	0.533**
	Second	318 (49.1)	15.37±3.13		10.42±3.43	
Gender	Male	169 (26.1)	15.20±3.27	0.604**	9.53±3.93	<0.001**
	Female	479 (73.9)	15.34±5.21		10.88±3.02	
Age group	≤20	397 (61.3)	15.21±3.43	0.749**	10.53±3.35	0.983**
	≥21	251 (38.7)	15.45±2.87		10.53±3.33	
Father's educational status	≤Primary school	218 (33.6)	15.38±3.24	0.982*	9.98±3.48	0.001*
	Secondary school	161 (24.8)	15.18±3.47		11.24±3.07††	
	High school	199 (30.7)	15.38±2.93		10.56±3.27	
	University	70 (10.8)	15.11±3.41		10.51±3.42	
Mother's educational status	≤Primary school	353 (54.5)	15.19±3.34	0.155*	10.37±3.32	0.267*
	Secondary school	140 (21.6)	15.89±2.73		10.99±2.94	
	High school	117 (18.1)	14.99±3.34		10.44±3.74	
	University	38 (5.9)	15.24±3.27		10.58±3.51	
Place of stay	With the family	242 (37.3)	15.39±2.76	0.313*	10.66±3.28	0.717*
	At home with a friend	108 (16.7)	15.58±3.21		10.32±3.33	
	Alone at home	49 (7.6)	15.65±3.27		10.61±3.20	
	In the dormitory	249 (38.4)	15.03±3.61		10.47±3.43	
The presence of healthcare workers in the family	No	548 (84.6)	15.32±3.20	0.937**	10.51±3.33	0.639**
	Yes	100 (15.4)	15.24±3.34		10.62±3.41	
Diagnosed chronic disease	No	594 (91.7)	15.27±3.26	0.674**	10.51±3.32	0.871**
	Yes	54 (8.3)	15.70±2.77		10.78±2.87	
Smoking	Non-smoker	434 (67.0)	15.30±3.21	0.611*	10.93±3.01#	0.002*
	Quitted	13 (2.0)	15.23±2.55		9.38±3.38	
	Smoking at least 1 cigarette a day	102 (15.7)	15.56±3.24		10.04±3.58	
	Occasional smoker	99 (15.3)	15.08±3.37		9.43±4.05	
Regular exercise	Exercising	163 (25.2)	15.44±3.45	0.256**	11.33±3.04	<0.001**
	Not exercising	485 (74.8)	15.26±3.14		10.26±3.39	

* Kruskal-Wallis Analysis of Variance, **Mann-Whitney U Test

*** Anesthesia (ANS), Oral and Dental Health (ODH), Medical Documentation and Secretariat (MDS), Medical Imaging Techniques (MIT), Medical Laboratory Techniques (MLT), First and Emergency Aid (FEA), Audiometry (ADY), Radiotherapy (RIT), and Nuclear Medicine Technician (NMT)

†Significantly higher compared to ODH, MDS, MIT, MLT, FEA, NMT, and ADY students (p<0.05).

†† The protective behaviors of students whose fathers have secondary school education are significantly higher than those whose fathers have primary school and below education (p<0.001).

The protective behaviors of students who do not smoke are significantly higher than occasional smokers (p<0.001).

media and the website of the Ministry of Health as their sources of information were significantly higher than those who did not use these fields (p<0.01, Table 7).

Of the students, 44.3% reported that they were afraid of being infected with COVID-19, 27.5% had had COVID-19, 79% had at least one relative diagnosed with COVID-19, and 29.2% had relatives who died of COVID-19. Of the students who had had COVID-19, 88.2% stated that they had had COVID-19 once, 9% twice, and 2.8% three times (Table 5). The mean knowledge scores of students who had had COVID-

19 three times were significantly higher compared to students who had had the disease once or twice (p<0.05). The mean behavior scores regarding protective measures against COVID-19 were significantly higher in students stating they were afraid of being infected with COVID-19, had had COVID-19 and had relatives who died of COVID-19 than in other students (p<0.01, Table 8).

DISCUSSION

Our study examined the knowledge and behaviors of health technician students studying at a public

Table 5. Students' general characteristics regarding their status of receiving education and attitude concerning COVID-19 and protective measures

Characteristics		n	%
Did you receive training on the prevention of infectious diseases during your student years?	Yes	417	64.4
	No	231	35.6
Have you received any training on COVID-19 to date?	Yes	323	49.8
	No	325	50.2
How much do you know about COVID-19, in your opinion?	None	2	0.3
	Very little	7	1.1
	Little	102	15.7
	Good	442	68.2
	Very good	95	14.7
What is your source of information about COVID-19? (Multiple options marked)	Social media (Facebook, Instagram, YouTube)	490	75.6
	Website of the World Health Organization	289	44.6
	Website of the Ministry of Health	413	63.7
	Websites of hospitals	203	31.3
	TV discussion programs/News	380	58.6
	Other (school, health personnel, etc.)	13	2.0
Are you afraid of being infected with COVID-19?	Yes	287	44.3
	No	361	55.7
Have you ever undergone a test for COVID-19?	Yes	414	63.9
	No	234	36.1
Have you been in contact with a COVID-19-positive patient?	Yes	340	52.5
	No	308	47.5
Have you had COVID-19?	Yes	178	27.5
	No	470	72.5
How many times have you had COVID-19? (n= 178)	Once	157	88.2
	2 times	16	9.0
	3 times	5	2.8
Do you have a relative diagnosed with COVID-19?	Yes	512	79.0
	No	136	21.0
Do you have a relative who died of COVID-19?	Yes	189	29.2
	No	459	70.8
Have you been vaccinated against COVID-19?	Yes	636	98.1
	No	12	1.9
How many doses of which vaccine have you received	Sinovac	114	17.6
	BioNTech	586	90.4
	TURKOVAC	5	0.8

university in Turkey at the end of the COVID-19 pandemic regarding COVID-19 and protective measures. Studies conducted with healthcare professionals and faculty of medicine students on this subject are at the forefront in our country and in the world, but the number of studies with health technician students is very low (18-20).

In our study, the scores obtained by health technician students from the knowledge questions about COVID-19 and protective measures varied between 0-22, and the mean score was found as 15.31±3.22. This score was considered as a moderate level. In a study conducted with health technician students from three universities in Turkey, Pirincci et al. stated that

they found their level of knowledge about COVID-19 to be very high (18). This study, in which six questions about the knowledge level of COVID-19 were asked, reported that the knowledge level score was evaluated between 0-6 and the mean value was 5.34±1.09. In our study, 27 questions were asked regarding the level of knowledge. The lower average of our students than the average in the study by Pirincci et al. can be explained by the high number of questions and detailed questioning. There are many studies conducted with faculty of medicine students and non-medical students in this field during the COVID-19 pandemic (21-25). In a study conducted with faculty of medicine seniors from six universities

Table 6. The relationship between students' status of receiving education about COVID-19 and protective measures and their knowledge and behavior regarding protective measures

Characteristics		n(%)	Knowledge Score Mean±SD	p	Behavior Mean±SD	p
Did you receive training on the prevention of infectious diseases during your student years?	Yes	417 (64.4)	15.61±2.90	0.010*	10.94±3.01	<0.001*
	No	231 (35.6)	14.75±3.67		9.77±3.74	
Have you received any training on COVID-19 to date?	Yes	323 (49.8)	15.74±2.87	0.001*	11.14±3.01	<0.001*
	No	325 (50.2)	14.87±3.49		9.92±3.53	
How much do you know about COVID-19, in your opinion?	None/Very little/Little	111 (17.1)	14.42±3.35#	<0.001**	9.77±3.46#	<0.001**
	Good	442 (68.2)	15.33±3.19##		10.58±3.18##	
	Very good	95 (14.7)	16.23±2.97		11.17±3.72	

*Mann-Whitney U Test, ** Kruskal-Wallis Analysis of Variance,

The COVID-19 knowledge and protective behavior scores of students with none/very little/little knowledge about COVID-19 are lower than those with good and very good knowledge (p<0.01).

The COVID-19 knowledge and protective behavior scores of students with good knowledge about COVID-19 are lower than those with very good knowledge (p<0.002).

Table 7. The relationship between students' source of information about COVID-19 and protective measures and their knowledge and behavior regarding COVID-19 and protective measures

What is your source of information about COVID-19? (Multiple options marked)		n(%)	Knowledge Score Mean±SD	p*	Behavior Mean±SD	p*
Social media (Facebook, Instagram, YouTube)	Yes	490 (75.6)	15.90±3.07	0.958	12.20±1.61	0.001
	No	158 (24.4)	15.00±2.64		11.67±2.30	
Website of the World Health Organization	Yes	289 (44.6)	17.60±1.81	0.005	12.60±1.94	0.121
	No	359 (55.4)	14.50±2.87		12.38±1.59	
Website of the Ministry of Health	Yes	413 (63.7)	17.14±2.41	0.001	12.83±0.98	0.001
	No	235 (36.3)	14.00±2.60		11.43±1.98	
Websites of hospitals	Yes	203 (31.3)	17.50±2.08	0.001	11.25±2.06	0.301
	No	445 (68.7)	14.89±2.93		12.44±1.50	
TV discussion programs/News	Yes	380 (58.6)	16.14±3.43	0.001	12.14±1.86	0.992
	No	268 (41.4)	15.17±2.31		12.00±1.67	
Other	Yes	13 (2.0)	15.69±2.89	0.739	12.08±1.70	0.153
	No	635 (98.0)	15.30±3.23		10.50±3.35	

*Mann-Whitney U Test

in Turkey, Çalışkan et al. reported that their levels of knowledge about COVID-19 were moderate (21). In a study carried out by Taghrir et al. in Iran, the level of knowledge of 5th-7th grade faculty of medicine students was evaluated as high (22). Many studies have reported that faculty of medicine students have

a deeper knowledge of COVID-19 than students from other faculties (23,24). It is an expected situation that the levels of knowledge about general diseases and COVID-19 among faculty of medicine students are higher than those of non-medical students. Furthermore, Alzoubi et al. stated in their study that

Table 8. The relationship between students' general characteristics of attitude toward COVID-19 and protective measures and their knowledge and behavior regarding COVID-19 and protective measures

Characteristics		n (%)	Knowledge Score Mean±SD	p	Behavior Mean±SD	p
Are you afraid of being infected with COVID-19?	Yes	287 (44.3)	15.09±3.38	0.075*	11.53±2.76	<0.001*
	No	361 (55.7)	15.68±2.87		10.64±3.17	
Have you ever undergone a test for COVID-19?	Yes	414 (63.9)	15.60±3.01	0.903*	11.18±2.88	0.749*
	No	234 (36.1)	14.06±3.47		9.28±3.87	
Have you been in contact with a COVID-19-positive patient?	Yes	340 (52.5)	15.45±3.18	0.887*	10.90±3.12	0.930*
	No	308 (47.5)	15.43±2.57		11.46±2.58	
Have you had COVID-19?	Yes	178 (27.5)	15.44±3.09	0.447*	10.99±3.04	0.037*
	No	470 (72.5)	15.25±3.27		10.35±3.43	
How many times have you had COVID-19? (n= 178)	Once	157 (88.2)	15.49±3.04	0.033**	11.03±3.04	0.192**
	2 times	16 (9.0)	14.19±3.41		10.13±3.22	
	3 times	5 (2.8)	18.00±2.00†		12.60±1.67	
Do you have a relative diagnosed with COVID-19?	Yes	512 (79.0)	15.57±2.93	0.204*	11.12±3.07	0.052*
	No	136 (21.0)	14.79±3.78		10.31±2.83	
Do you have a relative who died of COVID-19?	Yes	189 (29.2)	14.81±4.12	0.407*	11.22±2.60	0.045*
	No	459 (70.8)	15.76±2.37		10.53±3.76	
Have you been vaccinated against COVID-19?	Yes	636 (98.1)	15.54±2.92	0.182*	11.00±3.02	0.660*
	No	12 (1.9)	12.20±6.49		10.60±4.09	

*Mann-Whitney U Test, ** Kruskal-Wallis Analysis of Variance,

†The knowledge scores of students who have had COVID-19 3 times are significantly higher compared to students who have had the disease once or 2 times (p<0.05).

there was a significant difference between faculty of medicine students and students from other faculties (25). In their study on faculty of medicine and health sciences students, Gohel et al. determined that most students had sufficient knowledge (19). Although 96.9% of the students knew the main transmission route of COVID-19, the incorrect responses given by 85.8% to the question "If COVID-19 patients do not have a fever, they will not transmit the disease to others" and by 85.5% to the questions "There is no need to follow social distancing rules in the open area to ensure protection from COVID-19" and "Children and adolescents do not have to comply with preventive measures for COVID-19" suggested the necessity to inform students in more detail about preventive measures for the disease.

In our study, the scores obtained by health technician students from the attitude and behavior propositions regarding COVID-19 and protective measures varied between 0-14, and the mean score was found to be 10.53±3.34 points. This score was considered as

good. In their attitude and behavior propositions regarding COVID-19 and protective measures, 94.9% of the students stated that they paid attention to covering their mouth and nose while coughing or sneezing, 92.4% washed their hands more frequently than normal, and 88.1% wore a mask in crowded environments. In many reports from different countries, the hand hygiene compliance rate is 40% and 46.25% in critical care units (26,27). The COVID-19 pandemic has taught people that hand washing is one of the most effective ways to protect themselves from infectious diseases, and it is important to continue this. In their study performed on health technician students from three universities in Turkey, Pirincci et al. emphasized that they found the students' attitude and behavior scores regarding COVID-19 and protective measures to be very high contrary to their expectations and more than half of the students (59.6%) displayed positive hygiene behaviors (18). Taghrir et al. stated in their study that medical faculty students had high performance in

attitudes and behaviors related to COVID-19 and protective measures (22). Alzoubi et al. revealed no significant difference between medical faculty students and students from other faculties in attitudes and behaviors regarding COVID-19 and protective measures (25).

A significant difference was identified between the education program, gender, father's educational status, smoking and exercise habits of the students participating in our study and the total behavioral score averages regarding COVID-19 and protective measures. The significantly higher total behavior score averages regarding COVID-19 and protective measures of anesthesia technician students compared to students studying in other programs can be explained by the fact that these students received training on working in accordance with the operating room conditions and asepsis-antisepsis rules. There are very few such studies on health technician students in the literature, and such a program emphasis has not been observed. Like similar studies in the literature, our study found the total behavior score average regarding COVID-19 and protective measures to be higher in female students than male students. A study conducted with health technician students from three universities in our country determined that female students' knowledge and behavior scores regarding COVID-19 and protective measures were higher (18). In their study performed with students studying in the field of Medical Sciences, Zandian et al. indicated that the knowledge and behavior scores of female students were significantly higher than males and females were more conscious about COVID-19 (20). A similar study carried out with healthcare workers in our country revealed that females exhibited more positive behaviors (28).

Students who exercised regularly had higher total behavior score averages regarding COVID-19 and protective measures than students who did not exercise. The protective behavior scores of students who did not smoke were higher compared to occasional smokers. These data can be associated with the importance people attach to their health. It is normal for an individual who exercises regularly for his/her health and does not smoke to practice protective behaviors against COVID-19 and include them in his/her life. The protective behavior scores of students whose fathers had education at the secondary school level were higher compared to those whose fathers had primary school and below

education. This can be explained by the reflection of the family's education level on the protective behaviors of individuals.

The fact that students receive training on infectious diseases and COVID-19 affects their knowledge and behaviors regarding protective measures against COVID-19. It was found that the knowledge and behavior scores of students who received training were higher than those who did not receive training. Those who were afraid of being infected with COVID-19 had higher behavior scores regarding protective measures than those who were not afraid. This can be associated with the anxiety of having a disease. Likewise, it is seen that the behavior scores regarding protective measures of those who had had COVID-19 and those who had one of the relatives who died of COVID-19 were higher. On the other hand, the knowledge level of those who had had the disease three times was found to be higher. These data also indicate that having had a disease leads people to be informed about the disease.

In our study, the sources used the most by students to access information about COVID-19 were social media with 75.6%, the website of the Ministry of Health with 63.7%, and TV discussion programs and news with 58.6%. In their study on health technician students, Pirincci et al. reported that students indicated television as the source of information in the first place and social media in the second place (18). In similar studies performed with medical faculty students in our country, Çalışkan et al. stated that social media ranked first with 74.6% in accessing information about COVID-19, similar to our findings, whereas Gölbaşı et al. stressed that the most used source of information was international/national health authorities with 34.5% (29). The study carried out by Taghrir et al. on medical faculty students reported that sources such as the World Health Organization (WHO), CDC, and UpToDate were used the most in accessing information about COVID-19 with 17.1% (22). The study by Khasawneh et al. stated that medical faculty students used social media with 83.4% and online search engines with 84.8% as sources of information about COVID-19 (30). Similar to our research findings, Alzoubi et al. revealed in their study on medical faculty and non-medical students that social media was the most commonly used source of information (25).

It is an expected situation that there is a positive relationship between students' knowledge and behavior scores regarding COVID-19 and protective

measures. Our study detected a weak positive correlation between students' knowledge and behavior scores regarding COVID-19 and protective measures. Likewise, the study by Gölbaşı et al. reported a weak positive correlation between the scores from the knowledge questions about COVID-19 disease and the scores from the behavioral questions (29). In their study, Pirincci et al. emphasized that positive hygiene behaviors increased with the increasing knowledge score (18). The main limitation of this study is that it is inadequate to explain the cause-effect relationship between students' knowledge and behavior levels and the related factors since it is a cross-sectional study. Furthermore, it was assumed that the participants' answers were correct. It is an important limitation that the study was performed on a sample that could not be generalized to all health technician students. Difficulties catching up-to-date questions due to rapid developments in information about COVID-19 are among the other limitations. On the other hand, in addition to the fact that the research is one of the rare studies on health technician students, the fact that the data obtained are a source for future research and training is a strong feature making the study valuable.

CONCLUSION

As a result, it was revealed that the students participating in the study displayed positive behavior with regard to protective measures, although their knowledge about COVID-19 and protective measures was not at a high level. On the other hand, it should be taken into account in future arrangements, education and research that these students, who will be exposed to high biological risks in their professional life, give wrong answers to some propositions and exhibit wrong behaviors. Such studies that reveal knowledge deficiencies and misbehaviors in a comprehensive way should be taken into account and necessary arrangements should be made in the training of future health technicians and giving direction to education.

Acknowledgement: None.

Author contribution: All authors contributed equally to the study.

Conflict of interests: The authors have no conflicts of interest to declare.

Ethical approval: Dokuz Eylül University Non-Interventional Ethics Committee (Date: 11.05.2022, No: 2022/17-16)

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Peer-review: Externally peer-reviewed.

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