Assessment of Health Sciences Students' Knowledge and Awareness of the Covid-19 Pandemic: Sample of One University from Turkey

Sağlık Bilimleri Öğrencilerinin Covid-19 Pandemisine Yönelik Bilgi ve Farkındalıklarının Değerlendirilmesi: Türkiye'den Bir Üniversite Örneği

Mahmure Aygün [ID], Merve Murat [ID]

Department of Nursing, Health Sciences Faculty, Biruni University, Istanbul, Türkiye

Özet

Dünya'yı sarsan Covid-19 pandemisinin önlenmesi ve şiddetinin azaltılması, bireylerin bu hastalığa yönelik bilgi ve farkındalık kazanması ile sıkı bir şekilde ilişkilidir. Çalışma, bir üniversite özelinde sağlık bilimlerinde öğrenim gören öğrencilerin Covid-19 hastalığına yönelik temel seviyede bilgi ve farkındalık düzeyini değerlendirmek amacıyla yapılmıştır. Çalışma, kesitsel, tanımlayıcı özelliktedir. Araştırma verileri Haziran–Temmuz 2020 tarihleri arasında bir vakıf üniversitesinden, çevrimiçi test yolu ile toplanmıştır. Veri toplama aracı, Covid-19 hastalığı ile ilgili; virüs bilgisi, tanı, prognoz, tedavi gibi 7 bilgi-farkındalık alanına yönelik 25 çoktan seçmeli sorudan oluşmaktadır. Çalışmaya 14 sağlık disiplininden 339 öğrenci katıldı. Test doğru yanıt ortalaması 15.4±3.0 toplam puan ortalaması 61.7±14.5, bilgi-farkındalık seviyesi orta (50–64 puan) düzeyde bulundu. Öğrenciler, testte yer alan 7 soruya (1, 4, 13, 15, 18, 21 ve 22) ≥%71 oranında doğru yanıt verdi. Buna karşılık 7 sorunun (5, 7, 8 16, 1, 19 ve 2) doğru yanıt oranı ≤%50 bulundu. Pandemi takibinde izlenen "R" sayısının anlamı doğru yanıt oranı en az olan soru idi (%37.5). Virüsün adı olan SARS-CoV-2 ve sitokin fırtınasının tanımı düşük bilinme oranı gösteren sorulardı (sırasıyla % 41.3 ve %46.0). Tıp, Diş ve Eczacılık Fakültesi grubunun doğru yanıt oranları (%68.4), Sağlık Bilimleri Fakültesi ve Meslek Yüksekokulu gruplarına göre daha yüksekti (sırasıyla %60.3 ve %58.3, p=0.001). Öğrencilerin Covid-19 hastalığına yönelik bilgi-farkındalık düzeyleri orta seviyede bulundu. Sonuçlar, öğrencilerde bağımsız olarak bilimsel bilgiye yönelim, merak ve gündemi takip konusunda bir zafiyet olduğunu düşündürmektedir. Pandemiye ilişkin, periyodik bilgilendirme toplantıları, müfredatta bu konuya özgün ders saati eklenmesi gibi iyileştirme ve geliştirmeler yapılması önerilir.

Anahtar sözcükler: Bilgi, Covid-19, farkındalık, SARS-CoV-2, üniversite öğrencisi.

Abstract

Individuals getting information and understanding of the Covid-19 pandemic that shook the world are intimately tied to the disease's prevention and decreasing its severity. The purpose of the study is to determine the fundamental level of Covid-19 disease knowledge-awareness among university students studying health sciences. The study is descriptive and cross-sectional. The data were gathered using an online test administered by a private university between June and July 2020. It consists of 25 multiple-choice questions covering seven knowledge-awareness subject areas, including virus knowledge, diagnosis, prognosis, and treatment. 339 students from 14 different healthcare fields took part in the study. All students had a 15.4±3.0 correct answer average, a 61.7±14.5 total score average, and a moderate level of information awareness (=50–64 points). Seven of the test's questions (1, 4, 13, 15, 18, 21, and 22) were answered correctly by ≥71% of the students. Seven questions (5, 7, 8, 16, 1, 19, and 2), on the other hand, received a ≤50% correct response rate. For the pandemic question, the meaning of the reproduction number (R-value) received the lowest percentage of correct answers (37.5%). When asked about their names and implications, the virus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and cytokine storm had poor knowledge rates (41.3% and 46.0%, respectively). Students of the School of Medicine, Faculty of Dentistry, and Pharmacy had greater correct response rates (68.4%), than those studying at the Faculty of Health Sciences and Vocational School (60.3% and 58.3%, p=0.001, respectively). The level of knowledge-awareness regarding Covid-19 disease among students was determined to be modest. The findings imply that students struggle with independent orientation to scientific information, curiosity, and agenda-following. Some improvements, such as regular information sessions and a separate course hour dedicated to this subject in the curriculum to manage the pandemic are suggested.

Keywords: Awareness, Covid-19, knowledge, SARS-CoV-2, university student.

The coronavirus disease 2019 (Covid-19) pandemic, one of the most tragic public health crises of the century, left its mark in 2020 with its devastating effects on human health, the ordinary course of life and the world economy. It will likely continue to have these effects over the next 2 years due to the number of positive cases and mortality rates, and its actual results will be assessed over time. Considering its rapid spread and massive human losses, the areas where health systems have difficulty coping with this pandemic, it has been a frightening lesson for humanity and other future pandemics (Gorbalenya et al., 2020; Nicola et al., 2020; Republic of Turkey Ministry of Health The Coronavirus Scientific Advisory Board, 2020e; WHO, 2020c).

The disease first manifested itself in Wuhan City, Hubei Province, China, at the end of 2019, and the World Health Organization (WHO) declared a global emergency on January 30th, 2020. After approximately 40 days, on March 11th, 2020, the WHO declared the situation as a pandemic, pointing to more than 118,000 cases of coronavirus with a sustained risk of further global spread in more than 110 countries and territories worldwide (Huang et al., 2020; WHO, 2020e). Comparing the spread rate of the virus and the death rates, as of April 29th, 2020, according to WHO data, there were 3,123,894 confirmed cases and 217,300 deaths worldwide, while on September 11th, 2020, these numbers rose to 27,973,127 confirmed cases and 905,426 deaths (WHO, 2020d). The first Covid-19 cases in Turkey were identified on March 10th, 2020 and the first death was on March 17th, 2020. As of September 11th, 2020, the number of cases in Turkey reached 283,270 with 6782 deaths (Republic of Turkey Ministry of Health, Health Transformation Programme, 2020).

The spread of the disease in such a short time was related to the fact that the virus, different from its predecessors, has high transmissibility and can be transmitted from person to person by close contact through respiratory droplets. The disease causes acute respiratory failure due to severe pneumonia and also causes death in risk groups as a result of its devastating effects on the coagulation and immune system. It has created an impact that has strained the capacities of healthcare systems worldwide due to the patient load requiring intensive care (Huang et al., 2020; Öztürk, Taşova, & Ayaz, 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020e; Zhu et al., 2020).

During the pandemic, the prevention of the spread of coronavirus, treatment, safety precautions, and vaccine trials have been the main agenda of the whole world. Strategies for prevention and treatment, and guidelines for clinicians and society were developed and are updated in light of new data by the WHO and local Covid-19 scientific committees. In Turkey, on January 10th, 2020, with the participation of scholars from different fields of medicine at the Ministry of Health, the Covid-19 Scientific Committee was established. The Committee evaluates the emergency plans in the country in light of scientific data in all areas of combating this pandemic and develops updated guidelines (Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020a, d, e; WHO, 2020b; Wikipedia, 2020).

The initial uncertainties about this new disease have gradually become clear with clinical observations and scientific researches in the process. Increasing or even changing scientific information, decisions, and statistics are simultaneously made available to the public through mass media tools such as official publications of each country, news, and discussion programs of mainstream media channels and social media platforms. Also, in Turkey, the Scientific Committee members and other academics have been trying to gather accurate and current information to inform the public frequently via these same channels and have been involved in awareness-raising activities.

The whole world is going through extraordinary times due to the Covid-19 pandemic. The high infectiousness of the virus and the uncertainties in the prognosis and treatments of the disease, brought very strict infection control protocols to be followed. Prevention and reduction of the severity of the pandemic are closely related to the individuals gaining knowledge and awareness of the Covid-19 pandemic. Studies on health literacy for this pandemic are increasing in the literature (Okan et al., 2020).

Currently, students in healthcare disciplines are in an age group that are facing a pandemic for the first time. The pandemic process is an important experience for them, considering their profession after they graduated. In particular, healthcare professionals, such as physicians, nurses, paramedics, lab technicians, dentists, and pharmacists, are fighting on the front line in combating the pandemic. For these reasons, it would not be wrong to assume that health discipline students will have a different motivation to follow the scientific knowledge and agenda for the Covid-19 pandemic, seeing and feeling themselves as part of the health system. Most of the studies in this area are aimed at the knowledge level of medical faculty students (Aker & Mıdık, 2020; Çalışkan et al., 2020; Khasawneh et al., 2020; Lincango-Naranjo et al., 2021; Taghrir, Borazjani, & Shiraly, 2020; Yakar, Öztürk Kaygusuz, Pirinçci, Önalan, & Ertekin, 2020; Yang et al., 2021). The number of studies involving students in other health disciplines such as nursing, midwifery and paramedic is very low (Modi et al., 2020; Nemati, Ebrahimi, & Nemati, 2020).

Aimed at evaluating the knowledge-awareness levels of a university' health discipline students about the Covid-19 and SARS-CoV-2 virus through a comprehensive test, the present study was conducted to address the gap in the literature. The results of the study are expected to make an original contribution to the existing knowledge on the research subject. Based on an evaluation tool developed in line with the purpose of the study, the answers were sought for the following research questions:

- What are the knowledge-awareness levels of the sample group about Covid-19 and SARS-CoV-2?
- In which subject areas do the sample group have sufficient knowledge-awareness levels for Covid-19 and SARS-CoV-2?
- Are there any subject areas where the knowledge and awareness levels of the sample group regarding Covid-19 and SARS-CoV-2 are not sufficient?
- Is there a significant difference between the knowledge and awareness levels of students from different health disciplines about Covid-19 and SARS-CoV-2?

Method

Study Design

This was a descriptive cross-sectional study that used a comprehensive test to assess Covid-19 knowledge and awareness in students continuing their studies in healthcare disciplines. The data were collected between June and July 2020.

Written permission was first obtained from the Covid-19 Scientific Research Platform, which is part of the Republic of Turkey Ministry of Health, General Directorate of Health Services (No: 2020-05-09T13_04_40), and then from the university's non-interventional ethics committee (Date: 28.05.2020, No: 2020/40-02).

The population of the study was all the students in the healthcare departments of a private university (N=3325). An invitation e-mail was sent to a total of 2984 undergraduate and 341 associate degree students. Despite the fact that the study's goal was to reach the entire population, the sample size was calculated for the reliability of the study. The sample size for the study was calculated using a power analysis with a 90% significance level and a 5% error margin, and the representative sample size is 251 students. As a result, for the whole study, a minimum sample size of 251 students was required and a total number of 339 students were recruited in the current study.

Participants

The population of the study consisted of students who were studying in the healthcare disciplines at a private university in Istanbul. The groups to be included in the study were studying in the School of Medicine (SoM), Faculty of Dentistry (FoD), Faculty of Pharmacy (FoP), Faculty of Health Sciences (FoHS) (Nutrition and Dietetics, Child Development, Speech and Language Therapy, Midwifery, Occupational Therapy, Physiotherapy and Rehabilitation, Nursing, and Audiology Departments) and Vocational School of Health Services (VSoHS) (Surgical Technician, Oral Health Technician, Anesthetic Technician, First and Emergency Aid, Pathology, and Medical Laboratory) programs. The students enrolled in the relevant departments in the spring semester of the 2019–2020 academic year and answered all of the questions were included in the study.

Data Collection Instrument

A form developed by the researchers and structured within the scope of the study, consisting of 2 parts, was used as the data collection tool in the study. The first part consisted of a sociodemographic data form containing information about the department and class that the students were studying in. The second part included the Covid-19 Knowledge and Awareness Test.

COVID-19 Knowledge and Awareness Test: It aims to comprehensively measure the level of knowledge of healthcare discipline students in areas such as the virus, transmission, diagnosis, prognosis, treatment, and statistics regarding the Covid-19 pandemic.

The preparation of the test questions and options for the Covid-19 pandemic benefited from the Ministry of Health and WHO guidelines, as well as other studies (Demirbilek, Pehlivantürk, Özgüler, & Meşe Alp, 2020; Huang et al., 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020a, e; WHO, 2020b; Zhu et al., 2020). The questions and options addressed the basics of the pandemic and were based on available evidence-based and non-speculative information. Attention was paid to ensure that the questions could be answered by using the official information about Covid-19 which improves the health literacy of society. In this context, the questions were appropriate for students in all classes of health disciplines that make up the sample group. In the test, attention was paid to ensure that the questions and options understandable. The questions and options prepared were reviewed by three academics working in health sciences and the ethics committee, and were edited in line with their recommendations.

The test included a total of 25 questions and 7 subject areas about Covid-19 knowledge and awareness. These subject areas were popular-general knowledge (1, 2, 3, 21), virus characteristics (4, 7, 8, 9), transmission (5, 12, 14, 17), diagnosis (10, 11, 5), prognosis (13, 16, 19, 20), treatment (6, 22, 23), and statistics (18, 24, 25).

The Cronbach's alpha value of the test, which consists of 25 questions, is 0.61, which shows that the test has internal consistency for the sample group (Cohen, Manion, & Morrison, 2007).

Data Collection Process

The research questions were sent to the university e-mail addresses of the students using Google Forms. The questions were accessed only by the students, and the results only by the researchers. The online form, which was time-tracked with timify.me application that limit the quiz or exam time, and the test completion times of the students were recorded. The students were able to see their scores automatically at the end of the survey.

The test time for each question was 1 minute, considering the relatively short attention span of internet users. It was limited to a total of 25 minutes. Each participant could only answer the test once and returning to previous questions was impermissible.

Each correct answer was assigned 4 points and an incorrect answer was assigned 0 points. The total knowledge and awareness scores ranged from 0 to 100. The scores received by each participant were calculated (criterion-referenced). The level of knowledge and awareness was evaluated based on the total scores of the correct answers given to the test. Standard setting method based on judge's opinion (the Angoff method) was used to determine the levels of competence (Çetin & Gelbal, 2010; Erkuş, 2012). The competence committee consisting of six experts determined the minimum proficiency level of the test as 50 points, which is the failure value of the university grading system where the research was conducted. In line with expert opinions and based on university grading system, total score cut-off points were determined as: 0–49 points= poor, 50–64= intermediate, 65–80= good, and >81= very good.

In addition, in the Covid-19 knowledge-awareness test, the average correct response rates for each question were determined in order to analyze which areas had better awareness and in which areas there was a knowledge gap. According to expert opinions, the percentages of correct responses to the questions were categorized as ≤50%, 51–60%, 61–70%, and ≥71% in order to be able to remark on the things and provide useful feedback. In this manner, the study's 70% accurate answer rate was taken as a value expected to be earned by students in general. Questions with a total correct answer ≤50% were determined as the least, while those with ≥71% were the most correctly answered questions.

The average correct answer rates for the test questions and total scores were evaluated in terms of variables such as *(i)* the average knowledge-awareness level of the sample group, *(ii)* the differences between the departments of the average knowledge-awareness levels, *(iii)* the correct response rates for each question, and *(iv)* the correct response rates of the test subject areas.

Statistical Analysis

Statistical analysis of the study was performed using IBM SPSS Statistics for Windows 24.0 (IBM Corp., Armonk, NY, USA). Percentage, average, frequency, and minimum-maximum values were examined for the descriptive analysis. Normal distribution status was examined using the Kolmogorov Smirnov test, which showed normal distribution. The independent sample t-test was used for comparisons of 2 independent groups, and one-way ANOVA was used for comparisons of more than 2 independent groups in normally distributed data. For the reliability of the test, Cronbach's alpha coefficients was used.

Results

Of the 339 students participating in the study, 27.7% were first year, 24.5% second year, 21.8% third year, 21.5% fourth year, and 4.4% fifth year students. Faculty of Health Sciences was the group with the highest participation, at 69.6% (*n*=236). The mean time of the students for answering the test questions was found to be 18.0±7.0 min.

■■ Table 1 shows the healthcare students' correct answer and score distribution on the Covid-19 Knowledge and Awareness Test.

The Covid-19 Knowledge and Awareness Test average correct answer score of all of the students was 15.4±3.0. The average total score was 61.7±14.5, and the level of knowledge and awareness was medium (=50–64 points). The knowledge and awareness levels of the VSoHS and FoHS students were medium, and the knowledge and awareness levels of the students of the School of Medicine, Faculty of Dentistry and Pharmacy were good (=65–80 points). The correct response rates of the School of Medicine, Faculty of Dentistry and Pharmacy were higher than those of the other two groups (*p*=0.001).

■■ Table 2 shows the Covid-19 Knowledge and Awareness Test correct answer score distribution among the faculties.

The highest percentage of correct answers on the test was the location where the coronavirus pandemic began (97.3%). Students correctly answered where the polymerase chain reaction (PCR) samples were taken (86.4%), and the incubation period of the virus (SARS-CoV-2) that caused the pandemic (85.3%). The correct response rate of pneumonia, which is the primary respiratory complication caused by Covid-19, was 76.1%. There is no specific treatment information for the dis-

Table 1. Correct answer and score distribution of healthcare students' Covid-19 Knowledge-Awareness Test.

Variables		Participants (n=339)	Correct answer	Score	Correct answer and total score averages within the group	Intragroup comparison (% correct answer)	Comparison between groups (% correct answer)
		n (%)	$\bar{x}\pm SS$	$\bar{x}\pm SS$	$\bar{x}\pm SS$	p-value*	p-value*
VSoHS	Oral Health Tech.	6 (1.8)	15.6±1.5	59.3±9.6			
	Surgical Tech.	9 (2.7)	12.6±3.2	49.7±13.4	14.8±3.2 (58.3±13.0)	0.621	
	Anesthetic Tech.	23 (6.8)	15.4±3.2	61.3±12.6			
FoHS	N&D	32 (9.4)	14.8±4.0	59.8±15.9			
	CD	9 (2.7)	14.7±3.3	59.5±13.7			
	SLT	8 (2.4)	16.3±2.8	65.0±11.4			
	Midwifery	57 (16.8)	15.1±3.9	61.2±15.5	15.0±3.6 (60.3±14.6)	0.205	0.001
	OT	8 (2.4)	13.6±3.0	55.5±11.6			
	PT	10 (2.9)	14.1±2.2	54.8±10.3			
	Nursing	90 (26.5)	14.9±3.8	61.9±15.3			
	Audiology	22 (6.5)	15.0±2.8	63.6±11.1			
FoP	Pharmacy	21 (6.2)	17.1±3.2	68.1±12.7			
FoD	Dentistry	12 (3.5)	17.4±3.5	68.0±14.8	17.2±3.2 (68.4±13.1)	0.004	
SoM	Medicine	32 (9.4)	17.2±3.2	68.8±13.0			
	Total	339	15.4±3.6 (4–25)	61.7±14.5 (16–100)			

*One-way ANOVA, post-hoc Tukey HSD test, p<0.05. **FoD:** Faculty of Dentistry; **FoHS:** Faculty of Health Sciences; **FoP:** Faculty of Pharmacy; **CD:** Child Development; **ND:** Nutrition & Dietetics; **OT:** Occupational Therapy; **PT:** Physical Therapy and Rehabilitation; **SLT:** Speech and Language Therapy; **SoM:** School of Medicine; **VSoHS:** Vocational School of Health Services.

ease was answered correctly by 74.0% of the students. The United States of America, the country with the highest death rates, was accurately marked by 75.8% of the students. The meaning of the reproduction number (R-value) used in monitoring the pandemic had the lowest correct response rate (37.5%).

SARS-CoV-2, the name of the virus determined by the WHO, was correctly given by only 41.3% of the students. The correct response rate of question 8, which measured the virus structure that causes Covid-19, was 44.8%. The question regarding the rate of patients with mild-moderate symptoms was answered correctly by 44.0%. The meaning of cytokine storm, seen in severe cases, was accurately given by 46.0% of the students. The main mode of transmission of the virus was answered correctly by 46.3% of the students, and the names of the drugs in the Turkish Treatment Protocol were answered correctly by 50.1% (Table 2).

Table 3 shows the distribution of the test items according to the scoring range. The students answered ≥71% correctly to questions 1, 4, 13, 15, 18, 21, and 22 on the test. On the other hand, the correct answer rates of questions 5, 7, 8 16, 17 19, and 23 were ≤50%.

Table 4 shows the Covid-19 Knowledge and Awareness Test correct answer distribution among the Faculty of Health Sciences departments.

The Speech and Language Therapy Department had the highest rate of correct answers for 7 questions (1, 2, 3, 4, 6, 20, and 23). The Child Development and Occupational Therapy departments showed the lowest correct answer rates for question 7. The Nursing Department had the highest correct answer rate to question 8 about the virus structure.

The level of knowledge and awareness of the Speech and Language Therapy students in popular general knowledge, Anesthetic Technician students in diagnosis, Medicine students in prognosis, and Dentistry students in statistics was higher than those in the other departments (p=0.010, p<0.001, p=0.002, and p=0.029, respectively). There were no significant differences between groups in the other subject areas.

In Figure 1, the average correct answer percentages of the Covid-19 Knowledge and Awareness Test subject areas

Table 2. Distributions of Covid-19 Knowledge-Awareness Test correct answer among faculties.

Items	Total (n=339) n (%)	VSoHS (n=38) n (%)	FoHS (n=236) n (%)	FoD (n=12) n (%)	FoP (n=21) n (%)	SoM (n=32) n (%)
1. Where the coronavirus pandemic began	330 (97.3)	36 (94.7)	230 (97.5)	12 (100.0)	20 (95.2)	32 (100.0)
2. Meaning of "19" in the name of Covid-19	227 (67.0)	24 (63.2)	154 (65.3)	9 (75.0)	15 (71.4)	25 (78.1)
3. Academics on the Covid-19 scientific board	181 (53.4)	15 (39.5)	126 (53.4)	6 (50.0)	15 (71.4)	19 (59.4)
4. The incubation period of the virus	289 (85.3)	29 (76.3)	202 (85.6)	11 (91.7)	18 (85.7)	29 (90.6)
5. Main mode transmission of virus	157 (46.3)	16 (42.1)	107 (45.3)	6 (50.0)	12 (57.1)	16 (50.0)
6. The protocol for contacts in Turkey	178 (52.5)	15 (39.5)	124 (52.5)	9 (75.0)	13 (61.9)	17 (53.1)
7. Name of the virus	140 (41.3)	16 (42.1)	93 (39.4)	8 (66.7)	9 (42.9)	14 (43.8)
8. Virus structure	152 (44.8)	16 (42.1)	103 (43.6)	5 (41.7)	10 (47.6)	18 (56.3)
9. The receptor the coronavirus binds to	196 (57.8)	30 (78.9)	122 (51.7)	9 (75.0)	10 (47.6)	25 (78.1)
10. Diagnostic symptoms	238 (70.2)	32 (84.2)	164 (69.5)	7 (58.3)	10 (47.6)	25 (78.1)
11. Main diagnostic and screening test in Turkey	236 (69.6)	29 (76.3)	156 (66.1)	8 (66.7)	16 (76.2)	27 (84.4)
12. Transmission period	176 (51.9)	16 (42.1)	124 (52.5)	7 (58.3)	11 (52.4)	18 (56.3)
13. Primary respiratory complications	258 (76.1)	26 (68.4)	176 (74.6)	9 (75.0)	20 (95.2)	27 (84.4)
14. The meaning of filiation	183 (54.0)	25 (65.8)	111 (47.0)	8 (66.7)	16 (76.2)	23 (71.9)
15. Where PCR samples were taken	293 (86.4)	34 (89.5)	199 (84.3)	11 (91.7)	20 (95.2)	29 (90.6)
16. Patients with mild-moderate symptoms rate	149 (44.0)	24 (63.2)	88 (37.3)	7 (58.3)	8 (38.1)	22 (68.8)
17. The meaning of the reproduction number (R)	127 (37.5)	12 (31.6)	85 (36.0)	6 (50.0)	11 (52.4)	13 (40.6)
18. Country with the highest total deaths	257 (75.8)	26 (68.4)	176 (74.6)	12 (100.0)	16 (76.2)	27 (84.4)
19. The meaning of cytokine storm	156 (46.0)	12 (31.6)	106 (44.9)	4 (33.3)	13 (61.9)	21 (65.6)
20. Immunologic characteristics	214 (63.1)	19 (50.0)	150 (63.6)	9 (75.0)	14 (66.7)	22 (68.8)
21. WHO's first statement about the mask	265 (78.2)	22 (57.9)	188 (79.7)	10 (83.3)	21 (100.0)	24 (75.0)
22. Specific treatment for Covid-19	251 (74.0)	23 (60.5)	177 (75.0)	10 (83.3)	16 (76.2)	25 (78.1)
23. Drugs in the Turkey's treatment protocol	170 (50.1)	23 (60.5)	103 (43.6)	7 (58.3)	15 (71.4)	22 (68.8)
24. Mortality rate in Turkey	208 (61.4)	30 (78.9)	147 (62.3)	10 (83.3)	18 (85.7)	3 (9.4)
25. The number of Covid-19 cases in Turkey	189 (55.8)	14 (36.8)	138 (58.5)	9 (75.0)	13 (61.9)	15 (46.9)

FoD: Faculty of Dentistry; **FoHS:** Faculty of Health Sciences; **FoP:** Faculty of Pharmacy; **SoM:** School of Medicine; **VSoHS:** Vocational School of Health Services.

are given. Among these subject areas, the highest correct answer percentage was in diagnosis, while the lowest was in transmission.

Discussion

The results of the study show that the sample group has a medium level of knowledge-awareness. Although this result is related to the scope of the test and the cut-off points determined, it is still thought-provoking in several aspects. First, the data were collected four months after the emergence of the pandemic in Turkey. Therefore, the students had enough time to develop their health literacy on Covid-19. Second, the test questions were at the basic knowledge level of the subject and the students were studying in health disciplines. Third, taking the test was voluntary, and thus the participants may have been only those who were already interested in the subject. Considering these, it can be argued that all these factors are not reflected in the level of knowledge and awareness. The results found differed substantially from those of studies in the literature aimed at determining the Covid-19 knowledge level of students (Gallè et al., 2020; Khasawneh et al., 2020; Lincango-Naranjo et al., 2021; Modi et al., 2020; Olaimat, Aolymat, Shahbaz, & Holley, 2020; Taghrir et al., 2020; Yakar et al., 2020).

This difference may have been related to the higher number of questions on the test which were more specific than

Table 3. Distribution of test items according to scoring range.

Scoring range (%)	Items	n (%)
≤50	5. Main mode transmission of virus	157 (46.3)
	7. Name of the virus	140 (41.3)
	8. Virus structure	152 (44.8)
	16. Patients with mild-moderate symptoms rate	149 (44.0)
	17. The meaning of the reproduction number (R)	127 (37.5)
	19. The meaning of cytokine storm	156 (46.0)
	23. Drugs in the Turkey's treatment protocol	170 (50.1)
51–60	3. Academics on the Covid-19 Scientific Board	181 (53.4)
	6. The protocol for contacts in Turkey	178 (52.5)
	9. The receptor the coronavirus binds	196 (57.8)
	12. Transmission period	176 (51.9)
	14. The meaning of filiation	183 (54.0)
	25. The number of Covid-19 cases in Turkey	189 (55.8)
61–70	2. Meaning of "19" in the name of Covid-19	227 (67.0)
	10. Diagnostic symptoms	238 (70.2)
	11. Main diagnostic and screening test in Turkey	236 (69.6)
	20. Immunologic characteristics	214 (63.1)
	24. Mortality rate in Turkey	208 (61.4)
≥71	1. Where the coronavirus pandemic began	330 (97.3)
	4. The incubation period of the virus	289 (85.3)
	13. Primary respiratory complications	258 (76.1)
	15. Where PCR samples were taken	293 (86.4)
	18. Country with the highest total deaths	257 (75.8)
	21. WHO's first statement about the mask	265 (78.2)
	22. Specific treatment for Covid-19	251 (74.0)

those in the existing studies in assessing the knowledge and awareness of students about Covid-19. Examining these studies closely, it was clear that the questions had differences, such as the scope, form, number, and ease-difficulty levels, or some of the questions contained clues about the answer. Moreover, the high number of studies conducted on medical students make comparisons difficult.

The lack of valid and reliable measurement tools to measure the level of knowledge for specific groups causes difficulties in terms of evaluation, interpretation, and comparison of the measurement results. For this reason, the findings of this study were compared to both test subject areas and similar questions in other studies.

Popular-General Knowledge

Questions 1, 2, 3, and 21 of the study were intended to measure basic popular-general knowledge that may be had by the public. The first question was about where the coronavirus pandemic began, and it was the question that the students answered correctly at the highest rate. This question was asked in two studies and the results were similar to those herein (Modi et al., 2020; Taghrir et al., 2020). For the second question, which was about the meaning of "19" in the term Covid-19, the results had a high correct answer rate, as in a similar study in the literature (Yakar et al., 2020). The third question was about the Turkish academics on the CovidD-19 Scientific Committee, who were well known thanks to the TV broadcasts, and one name was not among the options. The correct answer rate for this question was at a low level, at 53.4%. A similar question was asked in the study of Gallè and others (2020) and they asked the students about the institutions responsible for pandemic management in Italy and found that the rate of awareness was very low, at 33.1%. Due to uncertainty related to the virus at the start of the pandemic, the WHO had made a

Table 4. Distributions of Covid-19 Knowledge-Awareness Test correct answer among faculty of health sciences departments.

| Questions	ND n (%)	CD n (%)	SLT n (%)	Midwifery n (%)	OT n (%)	PT n (%)	Nursing n (%)	Audiology n (%)
Item 1	32 (100.0)	9 (100.0)	8 (100.0)	57 (100.0)	8 (100.0)	10 (100.0)	86 (95.6)	20 (90.9)
Item 2	25 (78.1)	2 (22.2)	7 (87.5)	32 (56.1)	3 (37.5)	6 (60.0)	61 (67.8)	18 (81.8)
Item 3	14 (43.8)	5 (55.6)	6 (75.0)	34 (59.6)	4 (50.0)	4 (40.0)	51 (56.7)	8 (36.4)
Item 4	27 (84.4)	8 (88.9)	8 (100.0)	48 (84.2)	7 (87.5)	8 (80.0)	76 (84.4)	20 (90.9)
Item 5	14 (43.8)	5 (55.6)	3 (37.5)	30 (52.6)	3 (37.5)	5 (50.0)	38 (42.2)	9 (40.9)
Item 6	18 (56.3)	6 (66.7)	8 (100.0)	32 (56.1)	4 (50.0)	5 (50.0)	43 (47.8)	8 (36.4)
Item 7	17 (53.1)	5 (55.6)	3 (37.5)	18 (31.6)	4 (50.0)	3 (30.0)	37 (41.1)	6 (27.3)
Item 8	14 (43.8)	2 (22.2)	3 (37.5)	26 (45.6)	2 (25.0)	4 (40.0)	42 (46.7)	10 (45.5)
Item 9	18 (56.3)	3 (33.3)	2 (25.0)	29 (50.9)	2 (25.0)	4 (40.0)	47 (52.2)	17 (77.3)
Item 10	15 (46.9)	6 (66.7)	6 (75.0)	41 (71.9)	3 (37.5)	7 (70,0)	65 (72.2)	21 (95.5)
Item 11	18 (56.3)	4 (44.4)	5 (62.5)	40 (70.2)	5 (62.5)	7 (70.0)	62 (68.9)	15 (68.2)
Item 12	14 (43.8)	3 (33.3)	3 (37.5)	32 (56.1)	4 (50.0)	7 (70.0)	49 (54.4)	12 (54.5)
Item 13	21 (65.6)	4 (44.4)	6 (75.0)	45 (78.9)	6 (75.0)	9 (90.0)	66 (73.3)	19 (86.4)
Item 14	14 (43.8)	2 (22.2)	4 (50.0)	23 (40.4)	3 (37.5)	7 (70.0)	42 (46.7)	16 (72.7)
Item 15	26 (81.3)	9 (100.0)	5 (62.5)	47 (82.5)	8 (100.0)	9 (90.0)	75 (83.3)	20 (90.9)
Item 16	9 (28.1)	2 (22.2)	4 (50.0)	24 (42.1)	2 (25.0)	4 (40.0)	31 (34.4)	12 (54.5)
Item 17	15 (46.9)	5 (55.6)	3 (37.5)	18 (31.6)	3 (37.5)	2 (20.0)	34 (37.8)	5 (22.7)
Item 18	23 (71.9)	7 (77.8)	7 (87.5)	43 (75.4)	6 (75.0)	6 (60.0)	66 (73.3)	18 (81.8)
Item 19	16 (50.0)	7 (77.8)	4 (50.0)	28 (49.1)	1 (12.5)	1 (10.0)	43 (47.8)	6 (27.3)
Item 20	22 (68.8)	7 (77.8)	7 (87.5)	37 (64.9)	4 (50.0)	4 (40.0)	58 (64.4)	11 (50.0)
Item 21	26 (81.3)	7 (77.8)	8 (100.0)	44 (77.2)	8 (100.0)	8 (80.0)	70 (77.8)	17 (77.3)
Item 22	24 (75.0)	7 (77.8)	6 (75.0)	49 (86.0)	7 (87.5)	7 (70.0)	62 (68.9)	15 (68.2)
Item 23	12 (37.5)	4 (44.4)	5 (62.5)	24 (42.1)	1 (12.5)	4 (40.0)	42 (46.7)	11 (50.0)
Item 24	21 (65.6)	8 (88.9)	7 (87.5)	31 (54.4)	4 (50.0)	7 (70.0)	52 (57.8)	17 (77.3)
Item 25	19 (59.4)	6 (66.7)	3 (37.5)	33 (57.9)	7 (87.5)	3 (30.0)	48 (53.3)	19 (86.4)

CD: Child Development; ND: Nutrition & Dietetics; OT: Occupational Therapy; PT: Physical Therapy and Rehabilitation; SLT: Speech and Language Therapy.

statement with a confusing explanation that healthy people did not need to wear masks, and this issue was also discussed in Turkey (WHO, 2020a). It was found that the correct response rate for this question was 78.2%, and this high rate showed that this misinformation had not been forgotten. Interestingly, the reflections of this misinformation were seen in the early studies conducted in March and February. For example, in the study of Khasawneh and others (2020), only 19.3% of medical students said that "wearing a regular mask prevents you from getting the disease" and 60.6% of the students said yes to the item "only sick people should wear a mask to prevent the spread of the disease". In the study of Tagrir and others (2020), "All people in society should wear a mask" was coded as "False" in the evaluation and 82.1% of medical students stated this opinion.

Virus

The virus that causes the Covid-19 has been named SARS-CoV-2 because of its close similarity to the virus that causes severe acute respiratory syndrome (SARS). SARS-CoV-2 is a single-stranded RNA with a lipid envelope and has a complex genetic virus structure. The mechanism of SARS-CoV-2 virus infection occurs by binding the spike proteins to angiotensin-converting enzyme 2 (ACE-2) receptors on the surface of the host cell, and in this way, the virus enters the cell and releases its genomic RNA into the cytoplasm (Arabacı et al., 2020; Meş & Ağaçfidan, 2020; Öztürk et al., 2020; Republic of Turkey Ministry of Health Coronavirus Scientific Advisory Board, 2020e). The basic characteristics of the virus structure were discussed in detail by many scientists on Turkish TV channels.
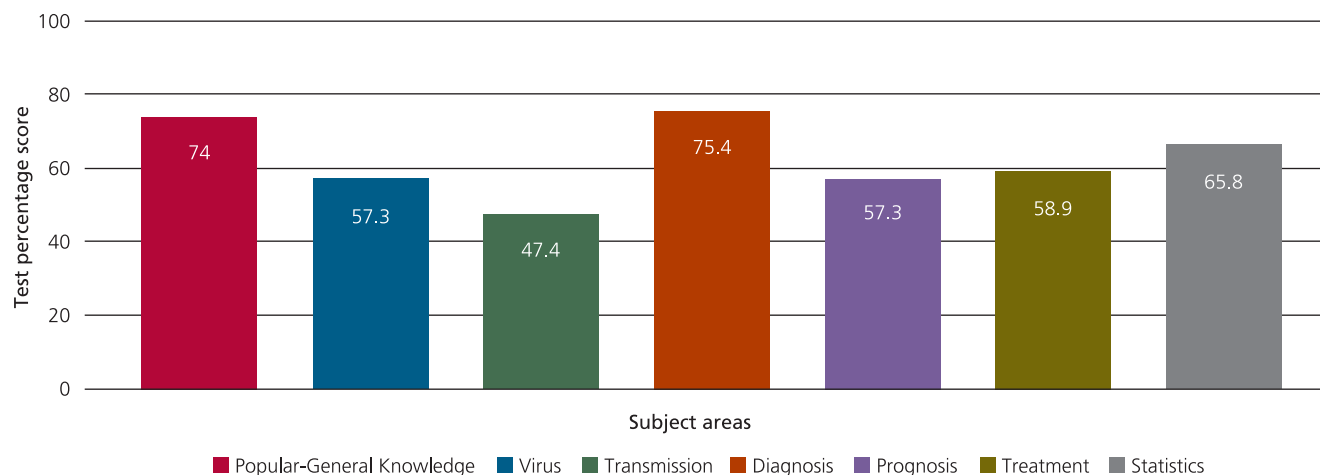
Figure 1. COVID-19 Knowledge-Awareness Test subject areas average percentage of correct answers.

Despite this information, it was observed that the rate of correct answers to questions 7, 8, and 9, in which the knowledge about the structural characteristics of the virus were evaluated, was quite low. Only 41.3% of the students were able to provide the name of the virus correctly. The result may have been related to the confusion experienced due to the more prominent name of the disease. The scientific naming of the virus is a more specific bit of information and students did not seem to have it. Similar to these results, the genetic structure of the virus in one study (Olaimat et al., 2020) and the name of the virus in two other studies (Yakar et al., 2020; Yang et al., 2021) had a low correct response rate. From these results, it can be interpreted that the students did not show sufficient interest in informing themselves about the structural characteristics of the virus, and/or their memorability was low. In a study where it was believed that the question included a clue, it was seen that the correct response rate for the RNA-based genetic structure of the virus was high (67.0%) (Lincango-Naranjo et al., 2021). In 2 studies, the rate of correct answers for the name of the virus was found to be high (Çalışkan et al. 2020; Kamate et al., 2020). The data collected so far have shown that the incubation period of the virus is between 2 and 14 days (Arabacı et al., 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020e). In the current study, the correct response rate of the incubation period of the virus was similar to that of the studies in the literature (Lincango-Naranjo et al., 2021; Olaimat et al., 2020; Taghrir et al., 2020; Yakar et al., 2020). In question 9 of the test, the receptor that the coronavirus binds to was asked about. This issue has been widely discussed in TV broadcasts, both in terms of the high rate of

ACE-2 receptors in the lung epithelial cells, which therefore affects the respiratory system, and ACE inhibitors and angiotensin receptor blocker drugs, which are frequently used in cardiovascular-hypertensive patients (Turgay Yıldırım, 2020). The correct answer rate ranged from 47.6% to 78.9%, and the VSoHS students answered this question correctly at a higher rate than even the medical students. The lowest correct answer rate to this question belonged to the Speech and Language Therapy and Occupational Therapy departments, at 25%. In the studies examined, no sample asked about the receptor structure that the virus binds.

Transmission

Four of the questions (5, 12, 14, and 17) in the study were about transmission. In this area, the level of knowledge of the students on the main mode transmission of the virus, transmission period, the meaning of filiation, and the meaning of the reproduction number (R-value) used during the pandemic was measured. Covid-19 is mainly transmitted by respiratory droplets. Moreover, it can be transmitted by contaminated hands touching the mucosa of the mouth, nose, or eyes. It has been reported that due to the current uncertainty regarding the transmission mechanisms, possible airborne transmission should also be considered. The scientific data has suggested that fecal-oral transmission is unlikely (İşsever et al., 2020; Meş & Ağaçfidan, 2020; Öztürk et al., 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020a, e; Wang et al., 2020). In the current study, it was found that the average correct answer rate to the questions about transmission was low, which was not expected. The route of transmission

was asked about in almost all of the studies examined, and the correct response rates were much higher than the results herein (Çalışkan et al. 2020; Gallè et al., 2020; Khasawneh, et al., 2020; Lincango-Naranjo et al., 2021; Olaimat et al., 2020; Taghrir et al., 2020; Yakar et al., 2020). The reason for this difference may be related to the way that the question was asked. In the question, the students were asked if they knew the wrong method of transmission via the statement "Orofecal spreading is the exact transmission route", which was correctly given by only a small group of 46.3%.

Even more sadly, one of the options of this question, "Virus-contaminated hands touching the mucosa of the mouth or face is the certain route of transmission" was marked by the students in the range of 0–16.7%. The transmission period of Covid-19 is not exactly known. It is thought that the duration of transmission may vary with regards to the severity of the disease. Moreover, severe cases of Covid-19 are known to have a high viral load and a long transmission time (Liu et al., 2020; Wang et al., 2020). Low correct response rates (51.9%) for the transmission period were likely related to the current uncertainties. For the purpose of determining the first source, the retrospective tracing the chain of contact related to an infectious disease and the follow-up of the contact persons is called contact tracing (Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020f). The basic reproduction number (R-value) is simply used to measure the transmission potential of a disease. It refers to how many different individuals will be infected from an infected individual during the period of infectiousness. Hence, a high contact ratio leads to a higher R0 value. For example, the R0 value in Turkey was 9.6 on day 10 and was reported as 1.30 on day 45 (Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020c).

Transmission period, contact tracing, and R-value were the areas that were not asked about in the other studies examined. The low correct response rates for the contact tracing definition in the study were surprising, because the information about the contact tracing work performed in Turkey had been given often by the Minister of Health in television briefings and also, the images of contact tracing teams had been shown in the media. Similarly, the R-value had been discussed in TV programs many times with statistics and models after the start of the impact of the pandemic in Turkey. However, it had the lowest correct answer rate, which could be because these two medical terms, which were added to the vocabulary of society through the pandemic, may not have attracted the attention of healthcare students or they may have had difficulty in remembering them, even if they had learned them.

Diagnosis

For confirmed Covid≥19 cases, the reported common complaints have focused on fever and cough (Guan et al., 2020; İşsever et al., 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020a). The main diagnostic and screening test in Turkey is based on the detection of RNA real-time reverse transcription-PCR. Nasopharyngeal or oropharyngeal swab samples are used for the PCR test (Arabacı et al., 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020c). There were three questions regarding the diagnosis of the disease on the test (questions 10, 11, and 15). The diagnostic symptoms had a high rate of accuracy, as in similar studies (Çalışkan et al., 2020; Khasawneh et al., 2020; Lincango-Naranjo et al., 2021; Olaimat et al., 2020; Taghrir et al., 2020; Yakar et al., 2020). The main diagnostic and screening PCR test and where its sample was taken from were answered correctly by students at higher rates. Similar high rates of awareness have been reported by studies including these items (Çalışkan et al., 2020; Lincango-Naranjo et al., 2021; Taghrir et al., 2020). The fact that body temperature measurements and the images of taking PCR test samples have been frequently shown on the television seemed to be reflected in these high rates of correct response.

Prognosis

Approximately 80% of Covid-19 cases are asymptomatic, or stage I and II patients, with only upper airway involvement. Pulmonary involvement causing pneumonia has been observed in approximately 20% of the cases, and Covid-19 pneumonia is severe at a rate of 15%, and more severe at a rate of 5%. Patients in this group require intensive care and result in severe pneumonia, respiratory failure, and multi-organ failure with 2–3% mortality. During the Covid-19 infection, macrophage activation syndrome characterized by cytokine storm due to accentuated immune response can be seen in 10% of patients. It may accelerate the deterioration of the condition of the patient critically (Devecioğlu, 2020; Meş & Ağaçfidan, 2020; Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020f). The rate of patients with pneumonia, the primary respiratory complications caused by Covid-19, and mild/moderate symptoms were answered correctly by the majority of the students. The results were similar to those of 2 studies evaluating these questions (Khasawneh et al., 2020; Olaimat et al., 2020). The images in mass media of the patients in the intensive care unit with severe respiratory distress or intubation were thought to be effective on these correct responses. The rate of patients with mild/moderate symptoms was correctly marked by 68.8% of the medical students

and 63.2% of the VSoHS students. In the other groups, the rate of correct answers to this question was low. The meaning of cytokine storm, which is more specific information about the disease, was not answered correctly by the majority of students in groups other than those in the Medicine and Pharmacy departments. During Covid-19, although IgM- and IgG-type antibodies can be detected in most of the patients, the length of antibody responses is not known, because SARS-CoV-2 is a new virus (Mavi & İnkaya, 2020). In the study, it was determined that the students gave correct answers to the question in this field at a sufficient level.

Treatment

To date, there has been no reliable and specific treatment for the Covid-19 disease. The treatments are symptomatic and experimental. In the Ministry of Health guidelines, there are Covid-19 treatment recommendations for infected patients and contacts (Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board, 2020a, b, e). In the current study, there was one question about the protocol for contacts and two questions about the treatment. The Ministry of Health guidelines recommend that anyone who has been in close contact with the infected patient should be monitored at home for 14 days in terms of fever and/or respiratory symptoms (Khasawneh et al., 2020). Question 6 on this subject included the wrong option, as "The contacts are immediately taken into the hospital". Only half of the students answered this question correctly and the highest correct answer rate was given by the Dentistry students (75%). In the studies of Taghrir and others (2020) and Çalışkan and others (2020), the correct response rates for a 14-day follow-up of the contacts were higher than the results herein. This difference was probably related to the fact that the question was written as a negative sentence. In parallel with the studies in the literature, the students were highly accurate in the "no specific treatment information for Covid-19" (Gallè et al., 2020; Lincango-Naranjo et al., 2021; Olaimat et al., 2020; Taghrir et al., 2020). In all of the information given to society, it has been emphasized that there is no reliable and specific treatment or vaccine; therefore, protective measures such as masks, social distancing, and hand washing are very important. The impact of this information seems to have been reflected in the correct response rates. On the other hand, the knowledge of the students in healthcare disciplines other than the pharmacy and medical students about the drugs in the Turkish Treatment Protocol was insufficient. Unlike the current study, Aker and Mıdık (2020) found that the level of knowledge of the medical students about drugs was low (41.2%). They also reported that only 7.2% of the students were interested in the

treatment, and they were most interested in "when and how the pandemic will come to an end", at a rate of 42.9%.

Statistics

Since the beginning of the pandemic, by the Turkish Ministry of Health, statistics such as the number of daily tests, confirmed cases, and deaths, have been shared with the public. These data are crucial to assess the progression of the pandemic and are closely followed by the community. The test included three questions to measure whether the students followed statistics related to Covid-19, such as the number of deaths and confirmed cases (questions 18, 24, and 25). The country with the highest deaths was answered correctly by the vast majority of students. However, awareness of current mortality rates and the number of cases diagnosed in Turkey was slightly lower. This result can be interpreted that, as the study was conducted in June–July, after a certain point, students felt tired of hearing about the latest information overload. Moreover, it was surprising that the medical students answered less correctly about the mortality rate in Turkey (9.4%).

When evaluated in terms of test subject areas, the Speech and Language Therapy in the popular-general knowledge and treatment, Dentistry in the virus and statistics, Pharmacy in the transmission, Anesthesia Technicians in diagnosis, and Medicine in the prognosis, the correct response averages were found to be higher.

The fact that the study data were collected from a single university and included only students in health disciplines limits the generalizability of the study and its comparability with other university students. The discontinuation of formal education due to the pandemic limited access to students and feedback. On the other hand, the data obtained from this small sample is original in terms of their scope, will contribute to the knowledge in the literature, and can be discussed in light of similar studies.

Conclusion

The results of the study point to a need that health disciplines students who continue their education at the university where the study was carried out should be supported with periodic educational interventions and training programs for Covid-19 and SARS-CoV-2.

The pandemic continues to take its toll all over the world. Every member of society, and especially young people, have an important responsibility in preventing the pandemic and reducing Covid-19 losses. For these reasons, it would be beneficial to conduct similar comprehensive evaluations with differ-

ent groups to identify areas of lack of knowledge-awareness. In health-related departments, solutions and improvements such as regular webinars and adding an extra course to the curriculum are recommended for students to gain reliable scientific knowledge and keener awareness about the pandemic.

References

Aker, S., & Mıdık, Ö. (2020). The views of medical faculty students in Turkey concerning the COVID-19 pandemic. *Journal of Community Health*, *45*(4), 684–688.

Arabacı, Ç., Aydın Tutak, G., Eroğlu Kesim, B., Ertürk, B., Ak, K., & Ağaç, E. (2020). The characteristics of SARS CoV-2 virus and microbiological diagnosis. *European Archives of Medical Research*, *36*(1), 10–20.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education.* 6th ed. London: Routledge / Taylor & Francis Group.

Çalışkan, F., Mıdık, Ö., Baykan, Z., Şenol, Y., Çınar Tanrıverdi, E., Tengiz, F. İ., & Gayef, A. (2020). The knowledge level and perceptions toward COVID-19 among Turkish final year medical students. *Postgraduate Medicine*, *132*(8), 764–772.

Çetin, S., & Gelbal, S. (2010). Impact of standard setting methodologies over passing scores. [Article in Turkish] *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*, *43*(1), 79–95.

Demirbilek, Y., Pehlivantürk, G., Özgüler, Z. Ö., & Meşe Alp, E. (2020). COVID-19 outbreak control, example of Ministry of Health of Turkey. *Turkish Journal of Medical Sciences*, *50*(SI-1), 489–494.

Devecioğlu, Ö. (2020). COVID-19 and hemophagocytic lymphohistiocytosis. *Istanbul University Institute of Health Sciences Journal of Advanced Research in Health Sciences*, *3*(1), 49–52.

Erkuş, A. (2012). Değerlendirme, değerleme, norm, norm geliştirme, normalleştirme nedir ne değildir? [Article in Turkish] *İlköğretim Online*, *11*(2), 1–6.

Gallè, F., Sabella, E. A., Da Molin, G., De Giglio, O., Caggiano, G., Di Onofrio, V., …Ferracutiet, S. (2020). Understanding knowledge and behaviors related to COVID-19 epidemic in Italian undergraduate students: The EPICO study. *International Journal of Environmental Research and Public Health*, *17*(10), 3481.

Gorbalenya, A. E., Baker, S. C., Baric, R. S., Groot, R. J., Drosten, C., Gulyaeva, A. A., … Haagmans, B. L. (2020). The species severe acute respiratory syndrome-related coronavirus: Classifying 2019-nCoV and naming it SARS-CoV-2. *Nature Microbiology*, *5*(4), 536–544.

Guan, W., Ni, Z., Hu, Y., Liang, W., Ou, C., He, J., & Liu, L. (2020). Clinical characteristics of coronavirus disease 2019 in China. *The New England Journal of Medicine*, *382*, 1708–1720.

Huang, C., Wang, Y., Li, X., Ren, L., Zhao, J., Hu, Y., … Zhang, L. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet*, *395*, 497–506.

İşsever, H., İşsever, T., & Öztan, G. (2020). Epidemiology of COVID-19. [Article in Turkish] *İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü Sağlık Bilimlerinde İleri Araştırmalar Dergisi*, *3*(S1), S1–S13.

Kamate, S. K., Sharma, S., Thakar, S., Srivastava, D., Sengupta, K., Jhurry Hadi, A., … Chaudhary, A. (2020). Assessing knowledge, attitudes and practices of dental practitioners regarding the COVID-19 pandemic: A multinational study. *Dental and Medical Problems*, *57*(1), 11–17.

Khasawneh, A. I., Humeidan, A. A., Alsulaiman, J. W., Bloukh, S., Ramadan, M., Al-Shatanawi, T. N., … Awad, H. H. (2020). Medical students and COVID-19: Knowledge, attitudes, and precautionary measures. A descriptive study from Jordan. *Frontiers in Public Health*, *8*, 253.

Lincango-Naranjo, E., Espinoza-Suarez, N., Solis-Pazmino, P., Vinueza-Moreano, P., Rodriguez-Villafuerte, S., Lincango-Naranjo, J., … Ortiz-Prado, E. (2021). Paradigms about the COVID-19 pandemic: Knowledge, attitudes and practices from medical students. *BMC Medical Education*, *21*(1), 128.

Liu, Y., Yan, L. M., Wan, L., Xiang, T., Le, A., Liu, J., … Peiris, M. (2020). Viral dynamics in mild and severe cases of COVID-19. *Lancet Infectious Disease*, *20*(6), 656–657.

Mavi, D., & İnkaya, A. Ç. (2020). COVID-19: Immunopathogenesis. *Flora*, *25*, 1–11.

Meş, S., & Ağaçfidan, A. (2020) Coronavirus: General features and current approach. [Article in Turkish] *İstanbul Üniversitesi Sağlık Bilimleri Enstitüsü Sağlık Bilimlerinde İleri Araştırmalar Dergisi*, *3*(S1), S14–S23.

Modi, P. D., Nair, G., Uppe, A., Modi, J., Tuppekar, B., Gharpure, A.S., & Langade, D. (2020). COVID-19 awareness among healthcare students and professionals in Mumbai metropolitan region: A questionnaire-based survey. *Cureus*, *12*(4), 2–18.

Nemati, M., Ebrahimi, B., & Nemati, F. (2020). Assessment of Iranian nurses' knowledge and anxiety toward COVID-19 during the current outbreak in Iran. *Archives of Clinical Infectious Diseases*, *15*(COVID-19), e102848.

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., … Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, *78*, 185–193.

Okan, O., Bollweg, T. M., Berens, E. M., Hurrelmann, K., Bauer, U., & Schaeffer, D. (2020). Coronavirus-related health literacy: A cross-sectional study in adults during the COVID-19 infodemic in Germany. *International Journal of Environmental Research and Public Health*, *17*(15), 5503.

Olaimat, A. N., Aolymat, I., Shahbaz, H. M., & Holley, R. A. (2020). Knowledge and information sources about COVID-19 among university students in Jordan: A cross-sectional study. *Frontiers in Public Health*, *8*(254), 1–9.

Öztürk, R., Taşova, Y., & Ayaz, A. (2020). COVID-19: Pathogenesis, genetic polymorphism, clinical features and laboratory findings, *Turkish Journal of Medical Sciences*, *50*(SI-1), 638–657.

Republic of Turkey Ministry of Health, Health Transformation Programme (2020). *COVID-19 situation report Turkey*. Retrieved from https://sbsgm.saglik.gov.tr/TR,66424/covid-19-situation-report-turkey.html (September 11, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020a). *COVID-19 (2019-n CoV hastalığı) Rehberi Bilim Kurulu çalışması*. Retrieved from https://covid19.saglik.gov.tr/ (February 21, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020b). *COVID-19 (SARS-CoV-2 enfeksiyonu): Antistokin-antiinflamatuar tedaviler, koagülopati yönetimi*. Retrieved from https://covid19.saglik.gov.tr/ (June 1, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020c). *COVID-19 (SARS-CoV-2 enfeksiyonu): Enfeksiyon kontrolü ve izolasyon*. Retrieved from https://covid19.saglik.gov.tr/ (June 1, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020d). *COVID-19 (SARS-CoV-2 enfeksiyonu): Genel bilgiler, epidemiyoloji ve tanı*. Retrieved from https://covid19.saglik.gov.tr/ (June 29, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020e). *COVID-19 (SARS-CoV-2 enfeksiyonu) Rehberi Bilim Kurulu çalışması*. Retrieved from https://covid19.saglik.gov.tr/TR-71456/rehberler.html (June 1, 2020).

Republic of Turkey Ministry of Health the Coronavirus Scientific Advisory Board (2020f). *COVID-19 (SARS-CoV-2 enfeksiyonu): Temaslı takibi, salgın yönetimi, evde hasta izlemi ve filyasyon*. Retrieved from https://covid19.saglik.gov.tr/ (June 1, 2020).

Taghrir, M. H., Borazjani, R., & Shiraly, R. (2020). COVID-19 and Iranian medical students: A survey on their related-knowledge, preventive behaviors and risk perception. *Archives of Iranian Medicine*, *23*(4), 249–254.

Turgay Yıldırım, Ö. (2020). The use of angiotensin converting enzyme (ACE) inhibitors and angiotensin receptor blockers (ARB) in COVID-19 pandemic. [Article in Turkish] *Çukurova Anestezi ve Cerrahi Bilimler Dergisi*, *3*(1), 47–52.

Wang, W., Xu, Y., Gao, R., Lu, R., Han, K., Wu, G., & Tan, W. (2020). Detection of SARS-CoV-2 in different types of clinical specimens. *JAMA*, *323*(18), 1843–1844.

WHO (2020a). *Advice on the use of masks in the context of COVID-19*. Retrieved from https://www.who.int/publications/i/item/advice-on-the-use-of-masks-in-the-community-during-home-care-and-in-healthcare-settings-in-the-context-of-the-novel-coronavirus-(2019-ncov)-outbreak (March 11, 2020).

WHO (2020b). *Infection prevention and control during health care when COVID-19 is suspected*. Retrieved from https://www.who.int/publications/i/item/10665-331495 (June 1, 2020).

WHO (2020c). *Naming the coronavirus disease (COVID-19) and the virus that causes it*. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/naming-the-coronavirus-disease-(covid-2019)-and-the-virus-that-causes-it (June 1, 2020).

WHO (2020d). *WHO Dashboard Coronavirus Disease (COVID-19)*. Retrieved from https://covid19.who.int (September 11, 2020).

WHO (2020e). *WHO Timeline - COVID-19*. Retrieved from https://www.who.int/news-room/detail/27-04-2020-who-timeline---covid-19 (June 1, 2020).

Wikipedia (2020). *The Coronavirus Scientific Advisory Board*. Retrieved from https://tr.wikipedia.org/wiki/Koronavir%C3%BCs_Bilim_Kurulu (July 2, 2020).

Yakar, B., Öztürk Kaygusuz, T., Pirinçci, E., Önalan, E., & Ertekin, Y. (2020). Knowledge, attitude and anxiety of medical students about the current COVID-19 outbreak in Turkey. *Family Practice and Palliative Care*, *5*(1), 36–44.

Yang, H., Zheng, Y., Yu, F., Cheng, B., Zhu, Z., Liao, S., … Wang, F. (2021). Knowledge, attitudes, social responsibilities and career plans toward Corona Virus Disease 2019 (Covid-19) among Chinese clinical medical students – Thoughts on medical education. *Frontiers in Medicine (Lausanne)*, *8*, 647679.

Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., … Zhao, X. (2020). A novel coronavirus from patients with pneumonia in China. *The New England Journal of Medicine*, *382*(8), 727–733.