COVID-19 Pandemic and Vaccination from The Perspective of University Students: Knowledge, Attitudes and Practices

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ABSTRACT

Aim: Our aim was to find out the knowledge, attitudes, and practices of university students regarding the COVID-19 pandemic, as well as to evaluate their vaccination status and the students' approaches to COVID-19 vaccination.

Methods: Our cross-sectional study was carried out in the province of Tokat between 01 December 2021 and 31 December 2021. The sample of the research consists of Tokat Gaziosmanpasa University students. The students were reached by sending an online survey to their corporate e-mails. The survey form consists of socio-demographic data and parts regarding knowledge, attitudes, and practices towards COVID-19 and vaccines.

Results: Our study included 1053 participants. The mean age of the participants was 22.1±5.2, and 56.2% were female. The rate of having COVID-19 among the participants was 27.8%. Of the students, 94.5% were vaccinated with the COVID-19 vaccines. The average correct response rate of the participants about the disease was 79.1±15.2%. Although the high rate of knowledge regarding the effectiveness of protective attitudes, it was seen that the rate of wearing a mask was 70.2% and just 49.9% of participants always avoid crowded areas.

Conclusion: The approaches of young people, who can be the source of transmission, regarding COVID-19 disease and vaccines are extremely effective in controlling the pandemic.

Keywords: COVID-19, vaccines, knowledge, attitude, students

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Introduction

Coronavirus disease (COVID-19) is a global health problem and was defined as a 'pandemic' by the World Health Organization (WHO) on March 11, 2020. This pandemic caused 340,543,962 confirmed cases and 5,570,163 deaths have been seen all over the world as of January 22, 2022. In our country, the COVID-19 data have been reported as 10,735,324 cases and 85,419 deaths as of the same date (1). The clinical course of COVID-19 disease can be asymptomatic, as well as have a wide spectrum that can result in severe respiratory symptoms and death. The most common symptoms are; fatigue, muscle aches, weakness, fever, cough, and shortness of breath (2). Currently, there is no specific treatment method for COVID-19 disease. Clinical management includes prompt implementation of recommended infection prevention and control measures and supportive management to prevent and/or control complications, including intensive care when needed (3,4).

The coronavirus disease (COVID-19) pandemic, which continues to exist as a very important concern globally, has drastically changed people's daily lives. The nature of the transmission and control strategies of the virus has restricted daily activities, livelihoods, and freedoms, as well as halting various religious obligations, traditional and socio-cultural practices among people in many parts of the world (5,6). Many measures announced and required by government agencies to successfully contain the pandemic are still being implemented. Since people's perceptions, attitudes, and behaviors towards the COVID-19 pandemic seriously affect the strategies and outcomes of combating the pandemic, researches on the subject are being conducted at an increasing pace.

Since the effectiveness of vaccines in the control of the pandemic is indisputable, vaccine studies were carried out rapidly in the COVID-19 pandemic. As of April 3, 2021, seven vaccines have been approved for full use and six for early or limited use in various countries (7). The COVID-19 vaccines have raised hesitation about vaccines in general and COVID-19 vaccines in particular. Despite the availability of vaccination services, the delay in accepting or rejecting vaccines is called 'vaccine hesitancy' (8). Vaccine hesitations exist in most WHO member states. The most cited reasons for vaccine hesitancy globally are; risk-benefit potentials (scientific evidence), lack of knowledge and awareness about vaccination and its importance, socio-cultural reasons such as religion, culture, gender, and socioeconomic problems related to vaccines (9).

The success of the vaccination campaign against the coronavirus disease depends on its response in all segments of society (10). A reason for this is that young adults, especially college students, are more likely to become infected with COVID-19 and transmit the infection to others. They may even be a source of transmission of the disease to populations at risk as super spreaders (11,12). However, young adults and students are critical populations for the vaccination campaign. They can play a role in conveying effective messages to increase vaccination within their families and communities (13). However, the interest in vaccination is low among young people because of their good health and the thought that they can overcome the disease asymptomatically (14). Different studies also point to this situation. In a study investigating the approaches of university students to COVID-19 vaccines in France, 58.0% of the students reported that they would prefer to be vaccinated. 45% of nursing students in a study conducted in seven countries in Europe reported that they preferred to be vaccinated. Similarly, in studies conducted with university students, the rate of preferring to get vaccinated was 63.8% in India, 52.8% in the United States (USA) (14-17).

We aimed to examine the knowledge, attitudes, and practices of university students regarding the COVID-19 disease pandemic, as well as to investigate the students' approaches to COVID-19 vaccines and their vaccination status. The results to be obtained are important in terms of providing information on university students, a population that can slow down the transmission and increases the effectiveness of vaccination.

Methods

Our cross-sectional study was carried out in the province of Tokat between 01 December 2021 and 31 December 2021. The sample of the research consists of Tokat Gaziosmanpasa University students. Students were reached via an online questionnaire sent to their institutional email addresses. Students were informed by a short message sent by the university administration. The data obtained from the survey forms participating in the study between the specified dates were evaluated.

The questionnaire was prepared by the researchers based on a literature review. The form consists of the first part inquiring about socio-demographic data, the second part questioning the level of knowledge about COVID-19 disease, the third part questioning the preventive attitudes from the disease, and the fourth part questioning the approaches to COVID-19 vaccines. The participants are allowed to give more than one answer to the question regarding the reasons for not being vaccinated.

Institutional permissions and approval documents numbered 21-KAEK-226 were obtained from the Ethics Committee of Tokat Gaziosmanpasa University for our study.

Descriptive analyses were made to give information about the general characteristics of the study groups. Data belonging to continuous variables were in the form of mean ± standard deviation; Data on categorical variables were given as n (%). When comparing means of quantitative variables between groups, the significance of the difference between two means and one-way analysis of variance were used. Cross tables and chi-square tests were used to evaluate whether there is a relationship between qualitative variables. When p values were calculated less than 0.05, it was considered statistically significant. Ready-made statistical software was used in the calculations (IBM SPSS Statistics 19, SPSS inc., an IBM Co., Somers, NY).

Results

1053 of the students contacted via e-mail, participated in our study by completing the online questionnaire. The mean age of the participants was 22.1±5.2, and 56.2% were female. The majority of the participants (32.4%) were term 1 students. 10.7% of the students had a diagnosis of chronic disease. The rate of having COVID-19 disease among the participants was 27.8%. 94.5% of the students were vaccinated with the COVID-19 vaccine. 91% of the participants were vaccinated with at least two doses of COVID-19 vaccines and they most frequently preferred BioNTech, Pfizer vaccine (79.4%) (Table 1). The average rate of the correct response of participants for the 18 statements about the disease that they were asked to evaluate was 79.1%±15.2%.

Table 1. General data regarding participants

Variable		n (%)
Gender	Female	592 (56.2)
	Male	461 (43.8)
Faculty	Health related	362 (34.4)
	Non- health	691 (65.6)
Terms	1	341 (32.4)
	2	243 (23.1)
	3	194 (18.4)
	4	127 (12.1)
	5	86 (8.2)
	6	62 (5.9)
Chronic Diseases	No	940 (89.3)
	Yes	113 (10.7)
Regular Medications	No	939 (89.2)
	Yes	114 (10.8)
Have you had a COVID-19 disease?	No	760 (72.2)
	Yes	293 (27.8)
Have you received inpatient treatment for COVID-19 disease?	No	1039 (98.7)
	Yes	14 (1.3)
Have you been vaccinated against COVID-19?	No	58 (5.5)
	Yes	995 (94.5)
If you have been vaccinated against COVID-19, please indicate how many doses of COVID-19 vaccine you have received	0	58 (5.5)
	1	37 (3.5)
	2	862 (82.1)
	3	79 (7.5)
	4	14 (1.3)
If you have been vaccinated against COVID-19, please specify which type of vaccine it is.	BioNTech	790 (79.4)
	CoronaVac (Sinovac)	147 (14.8)
	Both of	58 (5.8)

Two hundred and ninety-three (27.8%) of the participants had COVID-19 disease. When the variables were compared according to the status of having the disease, those who had the disease gave a statistically significant higher rate of correct answers to the statements about the clinic ($p<0.05$). In the answers given to the statement "COVID-19 disease can be transmitted through respiratory droplets", which was answered correctly by 89.6% of all participants, it was observed that those who had the disease responded with a statistically significantly higher rate.

Regarding comparing the genders of the participants, it was seen that women had a higher level of knowledge about COVID-19 disease than men. However, it has been determined that women pay more attention to preventive attitudes from the disease. Considering the answers given to the statements about the transmission routes of the disease, it was seen that although high correct response rates were observed in both genders, women had statistically higher rates. When the statements regarding the measures taken to reduce transmission were evaluated, it was seen that the thought that social isolation, frequent hand washing, wearing masks, and quarantine practices were ineffective and was more common among male students. The rate of the correct response to the statements about the clinic of COVID-19 disease was again higher in women ($p<0.05$).

The answers of the participants were compared according to the faculty variable, grouped as health-related and non-health related departments. In the answers given by the participants to the statements about the COVID-19 disease, the correct response rate of the students studying in the health-related departments was 84.6%±14.7%, while this rate was 76.2%±15.9% for non-health related students. The level of knowledge about the disease of the students of the health-related department was found to be statistically significantly higher ($p<0.05$). It has been observed that taking care of protective attitudes and vaccination status are also statistically higher in health-related department students ($p<0.05$). Distribution of variables by gender, faculty, and the state of having the COVID-19 disease were summarized in Table 2.

It was observed that there was an inconsistency between the answers given to the statements in which the effectiveness of protective attitudes aimed at preventing disease transmission which was questioned and the attitudes of the participants. 96.4% of all participants stated that crowded areas would increase transmission and 87.4% stated that wearing a mask is protective. However, it was seen that the rate of wearing a mask was 70.2% when the students were questioned about the protective attitudes towards the disease in their daily lives. The more striking result was that the rate of "always" answer given to the statement "I take care not to spend time in crowded areas" remained at 49.9%.

Ninety-one percent of the participants were vaccinated with at least two doses of COVID-19 vaccines. When the variables were compared according to their vaccination status, it was observed that those who were vaccinated had a statistically significantly lower rate of COVID-19 disease ($p=0.008$). Regarding the comparison of the vaccination status, there was no statistical difference according to the gender variable ($p>0.05$). The mean correct response rate of the unvaccinated group to the statements about COVID-19 disease was found to be 67.7%±11.8%. This rate was found to be below the general average of 79.1%±15.2% of the participants and 79.7%±16%, which is the average of the vaccinated group. The clinical findings of the disease, transmission routes, and lack of knowledge about protective methods were shown in our study, and the protective attitudes in the lifestyles of the unvaccinated group were also found to be statistically significantly lower than the vaccinated group ($p<0.001$) (Table 3).

Table 2. Distribution of variables by gender, faculty, and the state of having the covid 19 disease

Variables		Gender			Have you had COVID-19 disease?			Faculty		
		Female	Male	p	No	Yes	p	Health-related	Non-health	p
COVID-19 disease is a viral infection.	Wrong	11 (1.9)	7 (1.5)		18 (2.4)	0 (0)		3 (0.8)	15 (2.2)	
	No idea	64 (10.8)	65 (14.1)	0.256	108 (14.2)	21 (7.2)	<0.001	17 (4.7)	112 (16.2)	**<0.001**
	Right	517 (87.3)	389 (84.4)		634 (83.4)	272 (92.8)		342 (94.5)	564 (81.6)	
COVID-19 disease can be transmitted through respiratory droplets.	Wrong	11 (1.9)	18 (3.9)		23 (30)	6 (20)		1 (0.3)	28 (4.1)	
	No idea	38 (6.4)	42 (9.1)	0.029	64 (8.4)	16 (5.5)	0.170	6 (1.7)	74 (10.7)	**<0.001**
	Right	543 (91.7)	401 (870)		673 (88.6)	271 (92.5)		355 (98.1)	589 (85.2)	
COVID-19 disease can be transmitted while talking.	Wrong	37 (6.3)	28 (6.1)		50 (6.6)	15 (5.1)		9 (2.5)	56 (8.1)	
	No idea	44 (7.4)	50 (10.8)	0.156	73 (9.6)	21 (7.2)	0.284	27 (7.5)	67 (9.7)	**<0.001**
	Right	511 (86.3)	383 (83.1)		637 (83.8)	257 (87.7)		326 (90.1)	568 (82.2)	
COVID-19 disease can be transmitted by shaking hands.	Wrong	45 (7.6)	38 (8.2)		62 (8.2)	21 (7.2)		37 (10.2)	46 (6.7)	
	No idea	38 (6.4)	34 (7.4)	0.756	51 (6.7)	21 (7.2)	0.846	23 (6.4)	49 (7.1)	0.120
	Right	509 (860)	389 (84.4)		647 (85.1)	251 (85.7)		302 (83.4)	596 (86.3)	
COVID-19 disease can cause death.	Wrong	3 (0.5)	7 (1.5)		9 (1.2)	1 (0.3)		2 (0.6)	8 (1.2)	
	No idea	8 (1.4)	25 (5.4)	<0.001	24 (3.2)	9 (3.1)	0.448	5 (1.4)	28 (4.1)	**0.037**
	Right	581 (98.1)	429 (93.1)		727 (95.7)	283 (96.6)		355 (98.1)	655 (94.8)	
COVID -19 patients can fully recover.	Wrong	179 (30.2)	109 (23.6)		219 (28.8)	69 (23.5)		71 (19.6)	217 (31.4)	
	No idea	168 (28.4)	132 (28.6)	0.039	231 (30.4)	69 (23.5)	0.002	116 (320)	184 (26.6)	**<0.001**
	Right	245 (41.4)	220 (47.7)		310 (40.8)	155 (52.9)		175 (48.3)	290 (420)	
The risk of COVID-19 transmission is higher in crowded areas.	Wrong	1 (0.2)	9 (20)		8 (1.1)	2 (0.7)		0 (0)	10 (1.4)	
	No idea	8 (1.4)	20 (4.3)	<0.001	22 (2.9)	6 (20)	0.635	4 (1.1)	24 (3.5)	**0.005**
	Right	583 (98.5)	432 (93.7)		730 (96.1)	285 (97.3)		358 (98.9)	657 (95.1)	
Washing hands protects against COVID-19	Wrong	13 (2.2)	18 (3.9)		22 (2.9)	9 (3.1)		6 (1.7)	25 (3.6)	
	No idea	16 (2.7)	38 (8.2)	<0.001	43 (5.7)	11 (3.8)	0.453	12 (3.3)	42 (6.1)	**0.027**
	Right	563 (95.1)	405 (87.9)		695 (91.4)	273 (93.2)		344 (950)	624 (90.3)	
Wearing a mask is protective against COVID-19	Wrong	34 (5.7)	44 (9.5)		51 (6.7)	27 (9.2)		15 (4.1)	63 (9.1)	
	No idea	26 (4.4)	29 (6.3)	0.020*	47 (6.2)	8 (2.7)	0.036	8 (2.2)	47 (6.8)	**<0.001**
	Right	532 (89.9)	388 (84.2)		662 (87.1)	258 (88.1)		339 (93.6)	581 (84.1)	
The main symp-toms of COVID-19 disease are fever, cough, shortness of breath, muscle pain and fatigue	Wrong	1 (0.2)	7 (1.5)		4 (0.5)	4 (1.4)		0 (0)	8 (1.2)	
	No idea	15 (2.5)	32 (6.9)	<0.001	42 (5.5)	5 (1.7)	0.011	10 (2.8)	37 (5.4)	**0.017**
	Right	576 (97.3)	422 (91.5)		714 (93.9)	284 (96.9)		352 (97.2)	646 (93.5)	
As of today, there is no proven treat-ment method spe-cific to COVID-19.	Wrong	97 (16.4)	83 (180)		136 (17.9)	44 (150)		61 (16.9)	119 (17.2)	
	No idea	122 (20.6)	108 (23.4)	0.337	182 (23.9)	48 (16.4)	0.006*	71 (19.6)	159 (230)	0.401
	Right	373 (630)	270 (58.6)		442 (58.2)	201 (68.6)		230 (63.5)	413 (59.8)	
Quarantine appli-cation for COVID-19 patients is effective in preven-ting the spread of the pandemic.	Wrong	16 (2.7)	29 (6.3)		33 (4.3)	12 (4.1)		4 (1.1)	41 (5.9)	
	No idea	31 (5.2)	44 (9.5)	<0.001	59 (7.8)	16 (5.5)	0.415	11 (30)	64 (9.3)	**<0.001**
	Right	545 (92.1)	388 (84.2)		668 (87.9)	265 (90.4)		347 (95.9)	586 (84.8)	
Fever and shortness of breath occur only in the elderly and in COVID-19 patients with pre-existing lung disease.	Wrong	435 (73.5)	253 (54.9)		487 (64.1)	201 (68.6)		280 (77.3)	408 (590)	
	No idea	78 (13.2)	115 (24.9)	<0.001	156 (20.5)	37 (12.6)	0.009	40 (110)	153 (22.1)	**<0.001**
	Right	79 (13.3)	93 (20.2)		117 (15.4)	55 (18.8)		42 (11.6)	130 (18.8)	
Children and young people do not need to take protective measures against COVID-19	Wrong	559 (94.4)	381 (82.6)		679 (89.3)	261 (89.1)		342 (94.5)	598 (86.5)	
	No idea	17 (2.9)	44 (9.5)	<0.001	51 (6.7)	10 (3.4)	0.009	8 (2.2)	53 (7.7)	**<0.001**
	Right	16 (2.7)	36 (7.8)		30 (3.9)	22 (7.5)		12 (3.3)	40 (5.8)	
I make sure to wear a mask outside of the house.	Never	6 (10)	32 (6.9)		22 (2.9)	16 (5.5)		4 (1.1)	34 (4.9)	
	Sometimes	117 (19.8)	159 (34.5)	<0.001	201 (26.4)	75 (25.6)	0.135	91 (25.1)	185 (26.8)	**0.004**
	Always	469 (79.2)	270 (58.6)		537 (70.7)	202 (68.9)		267 (73.8)	472 (68.3)	
I try to avoid spending time in crowded areas.	Never	30 (5.1)	45 (9.8)		54 (7.1)	21 (7.2)		15 (4.1)	60 (8.7)	
	Sometimes	231 (390)	222 (48.2)	<0.001	337 (44.3)	116 (39.6)	0.36	186 (51.4)	267 (38.6)	**0.001**
	Always	331 (55.9)	194 (42.1)		369 (48.6)	156 (53.2)		161 (44.5)	364 (52.7)	

**Pearson chi-square test was used.*

Table 3. Distribution of variables by vaccination status

	Have you been vaccinated against COVID-19?		p*
	No	Yes	
	n (%)	n (%)	
Have you had COVID-19 disease?			
No	33 (56.9)	727 (73.1)	**0.008**
Yes	25 (43.1)	268 (26.9)	
COVID-19 disease a viral infection.			
Wrong	5 (8.6)	13 (1.3)	
No idea	6 (10.3)	123 (12.4)	**<0.001**
Right	47 (81)	859 (86.3)	
COVID-19 disease can be transmitted through respiratory droplets.			
Wrong	7 (12.1)	22 (2.2)	
No idea	12 (20.7)	68 (6.8)	**<0.001**
Right	39 (67.2)	905 (91)	
COVID-19 disease can be transmitted while talking.			
Wrong	10 (17.2)	55 (5.5)	
No idea	14 (24.1)	80 (8)	**<0.001**
Right	34 (58.6)	860 (86.5)	
COVID-19 disease can be transmitted by shaking hands.			
Wrong	15 (25.9)	68 (6.8)	
No idea	9 (15.5)	63 (6.3)	**<0.001**
Right	34 (58.6)	864 (86.8)	
COVID-19 disease can cause death.			
Wrong	4 (6.9)	6 (0.6)	
No idea	10 (17.2)	23 (2.3)	**<0.001**
Right	44 (75.9)	966 (97.1)	
COVID -19 patients can fully recover.			
Wrong	11 (19)	277 (27.9)	
No idea	7 (12.1)	293 (29.4)	**<0.001**
Right	40 (69)	425 (42.7)	
The risk of COVID-19 transmission is higher in crowded areas.			
Wrong	3 (5.1)	7 (0.7)	
No idea	7 (12.1)	21 (2.1)	**<0.001**
Right	48 (82.8)	967 (97.2)	
Washing hands protects against COVID-19.			
Wrong	6 (10.3)	25 (2.5)	
No idea	8 (13.8)	46 (4.6)	**<0.001**
Right	44 (75.9)	924 (92.9)	
Wearing a mask is protective against COVID-19.			
Wrong	23 (39.7)	55 (5.5)	
No idea	10 (17.2)	45 (4.5)	**<0.001**
Right	25 (43.1)	895 (89.9)	
The main symptoms of COVID-19 disease are fever, cough, shortness of breath, muscle pain, and fatigue.			
Wrong	3 (5.1)	5 (0.5)	
No idea	7 (12.1)	40 (4)	**<0.001**
Right	48 (82.8)	950 (95.5)	
As of today. there is no proven treatment method specific to COVID-19.			
Wrong	7 (12.1)	173 (17.4)	
No idea	7 (12.1)	223 (22.4)	**0.055**
Right	44 (75.8)	599 (60.2)	
Quarantine application for COVID-19 patients is effective in preventing the spread of the pandemic.			
Wrong	14 (24.1)	31 (3.1)	
No idea	7 (12.1)	68 (6.8)	**<0.001**
Right	37 (63.8)	896 (90.1)	
Fever and shortness of breath occur only in the elderly and in COVID-19 patients with pre-existing lung disease.			
Wrong	29 (50)	659 (66.2)	
No idea	19 (32.8)	174 (17.5)	**0.01**
Right	10 (17.2)	162 (16.3)	
Children and young people do not need to take protective measures against COVID-19.			
Wrong	43 (74.1)	897 (90.2)	
No idea	6 (10.3)	55 (5.5)	**<0.001**
Right	9 (15.5)	43 (4.3)	
I make sure to wear a mask outside of the house.			
Never	12 (20.7)	26 (2.6)	
Sometimes	28 (48.3)	248 (24.9)	**<0.001**
Always	18 (31)	721 (72.5)	
I try to avoid spending time in crowded areas.			
Never	14 (24.1)	61 (6.1)	
Sometimes	23 (39.7)	430 (43.2)	**<0.001**
Always	21 (36.2)	504 (50.7)	

** Pearson chi-square test was used.*

When the reasons for not getting vaccinated of 58 unvaccinated students were examined, it was seen that the most common reason (70.1%) was that they did not find the vaccines safe. 'Thinking that they will not get sick because they are young and healthy was the second most common (11.9%) reason. The reasons for not getting vaccinated are summarized in Table 4.

Table 4. Distribution of variables by reasons for not getting vaccinated

Reasons for not getting vaccinated	n (%)
I think COVID-19 vaccines are not safe.	47 (70.1)
If I become infected with COVID-19, I do not need to be vaccinated as I think that supportive care will be sufficient.	2 (3)
Illness depends on fate, if it is in my destiny, I will be sick, so I do not need to be vaccinated.	0 (0)
I think I will not be infected with COVID-19 because I am young and healthy.	8 (11.9)
Conventional treatment methods will be sufficient to prevent the disease.	3 (4.5)
I am afraid of having an injection.	3 (4.5)
I'm worried about side effects like pain and fever after the vaccine.	3 (4.5)
I can't get vaccinated for religious reasons.	1 (1.5)

Discussion

The coronavirus disease (COVID-19) pandemic has drastically changed people's daily lives and continues to spread globally as a major concern. Society's compliance with disease control measures is affected by people's knowledge, attitudes, and practices against COVID-19. Many studies have been carried out to develop effective vaccines, which are the most important tools in ending the pandemic. As a result of the studies, vaccination started all over the world with the COVID-19 vaccines, which were approved for emergency use. The success of vaccination depends on the majority of the population completing the recommended dose by the vaccination schedule. However, people's willingness to be vaccinated is profoundly affected by various factors. In our study, we investigated the knowledge, attitudes, and practices of university students against COVID-19, their approaches to COVID-19 vaccination, and their vaccination status. 1053 university students filled out the questionnaire form we prepared. The rate of having COVID-19 among the participants was 27.8%. 94.5% of the students were vaccinated with the COVID-19 vaccines. The average correct response rate of the participants about the disease was 79.1%±15.2%. Although the high rate of knowledge regarding the effectiveness of protective attitudes, it was seen that the rate of wearing a mask was 70.2% and just 49,9% of participants always avoid crowded areas.

The results of our study which showed that students have a high level of knowledge about COVID-19 were consistent with the literature. In a study conducted with university students in Ethiopia, it was reported that 73.8% of the participants scored above the average in the COVID-19 information questionnaire (18). In another study conducted in Japan, it was reported that university students have a high level of basic knowledge about COVID-19 and control measures (4).

The comparison of gender and level of knowledge has been investigated in many studies. Peng et al.'s (19) study with university students and Zhong et al.'s (20) study with the general population showed that women's knowledge levels were higher than men. However, in a study conducted with university students in Palestine and another study conducted with healthcare professionals in Uganda, it was reported that men have a higher level of knowledge than women (21,22). As shown in the study conducted with undergraduate students in Ecuador, there are also publications indicating that there is no statistical difference between knowledge levels and gender (23). In our study, it was seen that women had a higher level of knowledge about COVID-19 disease than men. The difference of this result according to the literature can be explained by the fact that our study was conducted in the later period of the pandemic, compared to other studies, and the participants were not the general population, but only university students.

As evaluated in similar studies in the literature, we compared the knowledge levels of the students according to their faculties in our study. In our study, it was observed that health-related faculty students had a higher level of knowledge than the others had. Similar statistical differences were also seen in

vaccination status too. In studies conducted in Jordan and Saudi Arabia, it was stated that health-related faculty students had higher levels of knowledge which showed similarity with our study (24,25). We also did a comparison between, those who have had the COVID-19 disease before and those who have not had it. 293 (27.8%) of the participants had COVID-19 disease. Those who had the disease gave a statistically significant higher rate of correct answers to the statements about the clinic ($p<0.05$). In our literature search, no comparison could be found in similar studies according to the variable of having a disease.

Knowledge and attitudes towards protective measures are extremely effective in controlling the pandemic. In our study, it was observed that the participants gave correct answers to the statements questioning information about protective measures at a very high rate. However, the students stated that they pay attention to protective measures at a much lower rate in their daily lives. Among the students, the rate of wearing masks was 70.2% and the rate of avoiding being in crowded environments was 49.9%. In a study conducted with university students in Indonesia, the rate of wearing a mask was found to be 86.9% (26). While this rate was reported as 96.4% in a study conducted in Japan, it was reported as 52.1% in Jordan (4,24). The diversity of literature data can be explained by various local factors such as social approach, bureaucratic practices, and the availability of protective equipment. In our study, we found that women take more precautions such as wearing masks and avoiding crowds in daily life than men do. Similarly, in a study conducted with undergraduate students in China, it was stated that women were more successful in taking protective measures than men (19). As with the gender factor, the faculties of the students also affect their attitudes. It has been shown in our study that health-related faculty students have a statistically significant higher agreement in protective measures than other students. Similar to our study, many studies in the literature have shown that medical and health-related faculty students have a high level of compliance with protective measures (4,18,24).

Vaccination is the most effective measure to control the COVID-19 pandemic, for which there is no cure yet. The success of vaccination depends on its acceptance and high vaccination coverage in the society (27,28). The young population, including university students, plays an active role at this stage. However, university students are generally evaluated in the age category (18-29 years) where vaccination is lower (29). In our study, we investigated the vaccination status of the participants. Among the participants, the rate of those who had at least one dose of vaccine was 94.5% and the rate of those who were not vaccinated was 5.5%. According to the data of the Ministry of Health in our country, the rate of unvaccinated individuals in society as of January 2022 is 7.69% (30). We think that vaccine rejection will decrease with the widespread use of the vaccine and its success in protection because previous studies have highlighted a high rate of vaccine hesitancy. According to a study done in our country in June 2021 on a population, the majority of which were between 18-25 years old and were university graduates or university students, 20.9% of the participants stated that they would not be vaccinated (31). In the literature, studies on COVID-19 vaccination have been carried out in many different countries. In a study conducted in the USA, the rate of those who reject the vaccine in the general population was reported as 14% (32). In another study conducted in the USA, it was found that 10.6% of university students did not consider getting vaccinated (29). In a study conducted with university students in Italy, the desire to get vaccinated was 86.1% (33). In studies conducted with similar populations, these rates were reported as 63.8% in India and 58% in France (11,14). The different results stated can be explained by the time and local factors variability of the studies. Unsurprisingly, in the health-related part of our study, it was seen that the students had a higher vaccination rate. Similar studies have also shown that the rate of vaccination is higher in students of the health-related departments (29).

In our study, it was seen that there was no significant difference in vaccination rates between the genders. Different studies on the subject have also reported that vaccination rates according to gender are

not affected (11,31). However, in a study conducted with university students in the USA, it was stated that women were 2.4 times more reluctant to be vaccinated than men were. However, in the same article, it was emphasized that this situation changed with the spread of the vaccination program, and according to official reports, women were vaccinated at a higher rate than men (29). As another variable, the state of having the disease was questioned in our study. Vaccination status was found to be statistically correlated with having COVID-19 disease. It was found that the vaccinated people fell ill less often. As far as we know, no comparison has been made regarding the transmission factor of the disease in the studies of COVID-19 vaccine attitude conducted with university students. We think that this limited information points to the necessity of comprehensive studies on the subject.

When the answers of 58 students who were not vaccinated among our participants were examined, it was seen that the most common reason for not being vaccinated was 'not considering the vaccines safe'. The results regarding the reasons for not being vaccinated in our study are consistent with the literature. A study showed that side effects and poor vaccine efficacy may be possible causes of vaccine hesitations among medical students (34). Studies among other populations have also reflected on the side effects of the vaccine, the rate at which the vaccine develops, the uncertainty about the efficacy and effective duration of the vaccine, and the medically reported several reasons for hesitation against COVID-19 vaccines, including mistrust (35-38). The lack of knowledge of the unvaccinated participants is also noteworthy. Due to the lack of information, the protective measures were also lower in the participants who were not vaccinated, as they were not aware of the pandemic and the severity of the disease.

Our study has the usual limitations of self-administered questionnaires. Vaccination status with COVID-19 vaccines may vary depending on time and the effectiveness of the pandemic. The results of our study, which is a cross-sectional research, can not be considered as predictors of vaccine acceptance. Despite these limitations, our study provides critical information about the factors affecting the acceptance of the COVID-19 vaccine among university students in Turkey. Moreover, the data presented in this study can provide insight into future studies about cross-sectional vaccination rates, accurate information about vaccines and disease, and reasons for not getting vaccinated.

Conclusion

In the past two years, the COVID-19 disease pandemic, which is the most effective pandemic of recent times, has severely affected the lives of young people as well as all age groups. The approaches and attitudes of young people, who are actively involved in social life and can be a source of transmission because they can survive the disease asymptomatically, are extremely effective in controlling the pandemic, regarding COVID-19 disease and vaccines. In our study, we investigated the knowledge, attitudes, and practices of university students regarding the COVID-19 disease pandemic, as well as students' approaches to COVID-19 vaccines and their vaccination status. High vaccination rates are promising. However, despite their high level of knowledge of the methods of protection against the disease, it is worrying that they reflect these practices to their attitudes in daily life at a much lower rate,. Although the end of the pandemic depends on these protective measures, the prolongation of the period causes a decrease in compliance with the measures. To get rid of this vicious circle and to end the pandemic, it is very important to inform people and spread vaccination. Due to the importance of the subject, there is a need for further studies with wide participation in the society.

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