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ORIGINAL ARTICLE

EVALUATION OF THE PERCEPTIONS AND ATTITUDES OF MEDICAL STUDENTS AGAINST THE COVID-19 PANDEMIC

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ABSTRACT

Aims: The Coronavirus Disease of 2019 pandemic has negatively affected human life all over the world. The current study aims to evaluate the perceptions and attitudes of medical students regarding the pandemic while raising awareness about the pandemic's social, economic, psychological, and academic reflections.

Methods: The research data were obtained through a questionnaire administered to 371 medical students and literature reviews. The questionnaire was administered through Google Forms. While preparing the questionnaire, the Scale of Evaluation of Perceptions and Attitudes towards the Coronavirus Disease of 2019 outbreak was used.

Results: It was found that male students and smokers viewed the disease as more dangerous, while female students presented avoidance behaviors more commonly. Students in the pre-clinical years tended to attribute the pandemic to conspiratorial and environmental reasons more than students in the clinical years. Second- and fourth-year students had higher avoidance behaviors than first-year students. Students who experienced the disease had higher scores in perception sub-dimensions, while students whose relatives had Coronavirus Disease of 2019 were more prone to avoidance behaviors.

Conclusion: It was determined that the Coronavirus Disease of 2019 pandemic affected students' mental well-being negatively and that the students' perception of disease, cause, control, and avoidance behaviors differed according to factors such as gender, smoking status, grade, and experiencing the disease.

Keywords: Behavior, COVID-19, medical students, perception

INTRODUCTION

Since 2019, the coronavirus pandemic has had various effects on many areas of human life, ranging from limited social interactions to economic hardships. The Coronavirus Disease of 2019 (COVID-19), which caused more than one million deaths less than a year after it was first reported in Wuhan, China, may be considered one of humanity's biggest challenges in the 21st century. Many states and organizations conducted studies to prevent, treat, and control the disease from the first moments of the fight against the pandemic (1).

Classifying the outbreak as a pandemic is a significant declaration in terms of its global effects on economic and social fields as well as the field of health (2). Therefore, it is essential to understand the psychological and social effects of the

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pandemic, first on society and then on the smaller groups that make up society. Measures taken on behalf of public health may affect social relations by weakening skills such as coping with stress, emotional control, and adaptation, which may lead to feelings of loneliness and fear being experienced more intensely. Along with factors such as quarantine, social isolation, and fear of illness, economic hardships may also advance psychological difficulties (3).

According to World Bank data, the crisis greatly affected global poverty, especially due to the disproportionate loss of income in the population working in the physical sectors that were more affected by the pandemic, which led to inequalities in society (4). Workers with lower education levels, women, and the younger side of the working population who were already disadvantaged have been affected more harshly (4). Türkiye's economy has also been exposed to the adverse effects of the pandemic (5). These outcomes and economic inequalities may have detrimental effects on university students since most of them are economically dependent on their families. Therefore, one of the groups most affected by the pandemic psychologically is university students (6, 7). Since emotional difficulties are one of the most common obstacles to academic success, it can be said that university students constitute a risk group (8). Emotional stress can affect the social and academic lives of students and reduce their success in higher education (9). Factors such as online education, staying away from class and campus life, and the anxiety of not having the necessary dominance over the profession they will perform in the future, in addition to other negative effects of the pandemic, have left students in a psychologically difficult situation (10).

Alsoghair et al. (11) found that 28.8% of fourth- and fifth-year medical students agreed that there was a higher chance of them being infected with COVID-19 than others. A study conducted on medical students in the United States found that most students (74.7%) agreed that the pandemic disrupted their education, and 83.4% accepted the risk of infection if they could return to the clinical setting (12). Furthermore, although online education may be sufficient to obtain information, it can create a feeling of inadequacy in medical students due to the lack of a physical environment for learning clinical skills (7).

The Coronavirus Disease of 2019 Pandemic

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or COVID-19 outbreak, which was first reported in Wuhan, China, in 2019 and then spread all over the world, was characterized as a pandemic by the World Health Organization (WHO) on March 11, 2020 (13). According to WHO data, as of January 14, 2024, the total number of cases reported was 774,291,287, and the total number of deaths was 7,019,704 (14).

Although most coronaviruses pathogenic to humans cause relatively mild clinical symptoms, there are exceptions, such as SARS-CoV and Middle East Respiratory Syndrome Coronavirus (MERS-CoV), which are highly transmissible and pathogenic, not much different than COVID-19 (15, 16). After the SARS-CoV epidemic that emerged in China in 2002 and 2003, MERS-CoV was seen in the Middle East 10 years later, and finally, the SARS-CoV-2 pandemic in 2019, which infected more people than the previous coronavirus outbreaks (16).

The main transmission route of the COVID-19 virus is through the aerosol respiratory droplets of the infected individual, and the highest risk of transmission occurs as a result of close contact (approximately 2 meters) with the carrier individual (17, 18). Sneezing, coughing, and talking allow the airborne spread of the COVID-19 virus (18). In confined spaces with limited ventilation, the virus can remain suspended in the air for a longer period and spread over a longer range (17). In addition, transmission can also occur by touching the mucosal surfaces (mouth, nose, and eyes) after contact with contaminated objects (18). It is known that regular and meticulous washing of hands with antiseptic soap for at least 20 seconds (especially before eating or after sneezing or coughing) and disinfecting frequently used surfaces at regular intervals reduce the spread of the COVID-19 virus by physical conctact, which is one of the most important ways of transmission (19). Therefore, hands should be kept away from the face as much as possible. In addition, respiratory hygiene is just as important as the virus can spread through the air via respiratory droplets. Respiratory hygiene includes covering the mouth when sneezing or coughing and wearing a mask. During the pandemic, social distance rules should be followed in all areas, and crowded environments should be avoided (19).

To keep the COVID-19 pandemic under control in the long term, it was vital to produce effective vaccines and deliver them to the majority of the world's population, in addition to individual protection methods. Vaccine applications are important tools, even if they are not sufficient alone to prevent the pandemic. The efficiency of vaccines during the pandemic depends on multiple factors such as sample size, demographic factors, host factors, the type of vaccine, and the number of doses (20).

As of January 30th, 2024, according to the numbers shared by official government agencies, approximately 71% of the world population has received at least one dose of a SARS-CoV-2 vaccine, and 13.53 billion doses have been administered in total (21). In Türkiye, as of September 24th, 2023, in the population aged 18 and over, the rate of first-dose vaccination was 93.38%, the second-dose vaccination rate was 85.70%, and the third-dose vaccination rate was 45.5%, according to the Ministry of Health of the Republic of Türkiye (22). According to the mathematical model developed by Watson et al. (23), considering the official number of deaths, it has been estimated that 18.1 million people would have lost their lives if there were no vaccinations within one year and that existing vaccinations have prevented 79% of these estimated deaths.

Although it is not sufficient on its own, as stated before, vaccination is an important step in controlling the pandemic and restoring social and economic order as soon as possible. For this purpose, it is crucial to eliminate the prejudices in every society against vaccination or protection methods by raising

the necessary awareness. According to the report of the Center for Countering Digital Hate, the number of followers of social media accounts managed by so-called anti-vaccine movements has increased by at least 7.8 million in roughly the first year of the initial reporting of COVID-19, and this movement revealed an annual profit of approximately one billion United States dollars in social media (24). Authorities must focus on instilling confidence in those who have doubts and fears to prevent the negative consequences of anti-vaccination (25).

Perception and Attitudes

Fears associated with the disease, the need for constant protection, and practices such as social distancing and quarantine, which limit social relations, have also negatively affected social and individual psychology during the COVID-19 pandemic. As a result of these factors, extreme stress, anxiety, and depression have been observed (26).

In a study conducted by Quintiliani et al. (27) in Italy, it was shown that 54.4% of university students had decreased attention spans and 55% had concerns regarding exam outcomes. It was also found that 89.4% experienced increased stress (27). Another similar study conducted on university students in Spain found that 57.5% of the students felt worse psychologically, while 14.7% felt much worse after COVID-19 (28).

The COVID-19 pandemic has created social and psychological effects in Türkiye as well as all over the world. In a survey study conducted by Satici et al. (29) in 2021 investigating the psychological effects of the pandemic on society, it was found that fear of COVID-19 significantly increased depression, anxiety, and stress and decreased life satisfaction.

In another study conducted by Peker and Cengiz (30), the finding that fear of COVID-19 reduces happiness levels and increases stress is supported, and it has been reported that stress coping strategies reduce stress, and those who use these techniques have lower psychopathological risk levels when they encounter stress related to the pandemic.

Cam et al. (31) stated that in Türkiye, 64.6% of the university students showed signs of depression, 45.2% felt anxiety, 45.2% experienced stress, and 34.5% experienced post-traumatic stress disorder (PTSD) symptoms (all of which are students' self-diagnosis), and female gender and low-income family relationships are important risk factors for the ailments mentioned above. Torun and Torun (32) found that most medical students experienced severe anxiety about contracting the COVID-19 infection, and their stress levels increased, especially in females and students from low-income families, and one-third of them experienced disruptions in their sleep and eating patterns.

According to the findings of Oral and Karakurt (33), it was determined that university students' uncertainty and intolerance due to COVID-19 increased significantly. This increase may cause students to experience negative emotions more frequently or have difficulty adapting to daily life, thus perceiving unforeseen events as more dangerous, and may increase their tendency to experience high stress, anxiety, and depression (33).

Çınar Tanrıverdi et al. (34) reported that 76.3% of medical students preferred face-to-face education, 25.1% of these students experienced PTSD symptoms, and 23.6% had insomnia. It was found that PTSD symptoms were more common in students who followed the news about the pandemic on social media, and similar to previous studies, students were more concerned about the health of their relatives than their own (34). It has been reported that students in the more advanced academic years were more hopeless about the impact of the pandemic on their lives (35).

Therefore, it can be said that studies conducted on medical students in Türkiye have also yielded similar results to studies conducted on university students in different parts of the world mentioned previously.

It is important to raise awareness of the disease in society to control a potential outbreak in the future and take action on the effects of the recent COVID-19 pandemic. For this reason, a comprehensive understanding of perceptions and reactions against the disease is vital in combat strategies, and awareness of the potential effects and consequences of COVID-19 on the individual should be provided (36, 37). Raising public awareness will also encourage individual measures to prevent diseases (37).

This study aimed to evaluate and examine the perceptions and attitudes of medical students after the COVID-19 pandemic, raise awareness about the effects of the pandemic, such as depression, anxiety, health anxiety, and social isolation, along with the social, economic, and psychological reflections of the pandemic, and contribute to literature research.

MATERIAL AND METHODS

In this descriptive, cross-sectional study, all the rules specified in the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with and approved by the Başkent University Medical and Health Sciences Research Board (date: 01.02.2022, decision number: KA22/51). Informed consent was obtained from all of the participants.

Within the scope of the above-mentioned literature reviews and this research, it has been observed that different attitudes and behaviors toward the perception of COVID-19 disease were exhibited. Accordingly, the following hypotheses were formed:

H1: There is no significant difference in the perception of the disease by gender.

H2: There is no significant difference between the academic years of the students for the perception subscales (disease, cause, control) of the COVID-19 disease.

H3: There is no significant difference between the students who experienced the disease (themselves or through a relative) and those who had not, according to their avoidance behaviors.

H4: There is no significant difference between the disease perceptions of smoking and non-smoking students.

Statistical Analyses

Statistical analyses within the research scope were made using the IBM SPSS Statistics 25.0 package program. Descriptive statistics of the variables are given as frequency and percentage for discrete data, while mean and standard deviation are given for continuous data. The Kolmogorov-Smirnov test was used to control the study's normality distribution and it was detected that the data was normally distributed. Correlation analysis was applied when checking the relationship between categorical variables. Independent Sample t-test and analysis of variance test were used in statistical analysis for the study data with normal distribution. The groups that made the difference in the variables whose significance was detected with least significant difference from post hoc tests were determined. The hypotheses were evaluated by comparing p-values obtained in the statistical analyses and $p<0.05$ was considered as statistically significant.

Sample

The sample of this research consists of 371 students studying at the Başkent University School of Medicine in Ankara in the 2021-2022 academic year. 68% of the students were female and 32% were male. It was observed that most of the participants were first-year students with 22%, and third- and fourth-year students followed with 20%. The gender distribution of the students according to year levels is given in Table 1. As can be seen in Table 1, the participants are mostly female in all academic years. The distribution of COVID-19 transmission status according to the academic years of the students is given in Table 2. Although 55% of sixth-year students have had COVID-19, the majority of other-year students have not. It was determined that most of the students included in the study had relatives who had COVID-19.

Measurement Tools

Perceptions and Attitudes towards the COVID-19 Pandemic Questionnaire were used in the study. The questionnaire is a 5-point Likert questionnaire and consists of a total of fifty-three items (38). The forms were created by Çırakoğlu (38) during the swine flu (H1N1) epidemic. Then, it was adapted to be used in the COVID-19 pandemic and the validity and reliability of the forms were verified by Artan et al. (39). With the context given, the questionnaire consisted of four subscales later adapted for the COVID-19 pandemic: perception of the disease, perception of causes of the disease, perception of control of the disease, and avoidance behaviors (38, 39). Perception subscales (perception of disease, causes, and control) are 5-point Likert-type questionnaires consisting of options between "1- Strongly agree" and "5- Strongly disagree." Options in the avoidance behaviors subscale varied from "1- I never did this" to "5- I frequently did this," some of which were reverse coded (38, 39).

Table 1. Gender distribution of students according to grade levels.

	Gender	
	Female (n=253)	**Male (n=118)**
Grade 1	58 (72.5%)	22 (27.5%)
Grade 2	47 (69.1%)	21 (30.9%)
Grade 3	48 (65.8%)	25 (34.2%)
Grade 4	49 (66.2%)	25 (33.8%)
Grade 5	38 (67.9%)	18 (32.1%)
Grade 6	13 (65%)	7 (35%)
Total	253 (68.2%)	118 (31.8%)

Perception of Disease

The subscale consisting of 8 items for the perception of disease measures the perception of the disease's properties, such as contagiousness and mortality. Higher scores in this subscale were accepted as the participants viewed the disease as more dangerous than participants with lower scores.

Perception of Cause

The subscale consists of 18 items for the perception of causes, including items questioning the perceptions of the reasons for the existence of the disease. Items in this subscale were intended to question three different concepts that may have been believed to have caused the pandemic, including conspiracy (questions 9-14), environment (questions 15-22), and faith (questions 23-26). The conspiracy subgroup evaluates the prevalence of beliefs such as an organization or a government knowingly causing the pandemic with ulterior motives such as experimenting on a biological weapon or a way of creating more demand for medicine to contribute to the economic system. The environment subgroup questions environmental reasons such as pollution, global warming, unhealthy diet, and overpopulation. The faith subgroup aims to determine if the participant attributes the pandemic to a religious reason such as god's wrath against social degradation or the pandemic being predetermined in humankind's destiny. These subgroups together form the perception of cause subscale and were compared together with other subscales as a whole while the faith, environment, and conspiracy subgroups were compared between themselves separately.

Table 2. Distribution of students who have had COVID-19 and relatives of the students who have had COVID-19 according to their grade levels.

	Had COVID-19		Relatives had COVID-19	
	Yes (n=149)	**No (n=222)**	**Yes (n=312)**	**No (n=59)**
Grade 1	32 (40%)	48 (60%)	66 (82.5%)	14 (17.5%)
Grade 2	33 (48.5%)	35 (51.5%)	62 (91.2%)	6 (8.8%)
Grade 3	33 (45.2%)	40 (54.8%)	60 (82.2%)	13 (17.8%)
Grade 4	15 (20.3%)	59 (79.7%)	59 (79.7%)	15 (20.3%)
Grade 5	25 (44.6%)	31 (55.4%)	49 (87.5%)	7 (12.5%)
Grade 6	11 (55%)	9 (45%)	16 (80%)	4 (20%)
Total	149 (40.2%)	222 (59.8%)	312 (84.1%)	59 (15.9%)

COVID-19: Coronavirus Disease of 2019

Perception of Control

The subscale for the perception of control consists of 13 items in total, and it aims to evaluate the reliability of both personal and mandated prevention techniques in the eyes of the participants, including items such as "What is done to stop the spread of the disease is sufficient" and "The personal measures I take are sufficient to avoid catching this disease".

Avoidance Behaviors

The avoidance behaviors subscale consists of 14 items. It aimed to evaluate the prevalence of avoiding the disease mentally by including items such as "not reading newspaper news about the pandemic" and "leaving places where the pandemic is discussed". Participants with higher scores in the avoidance behaviors sub-dimension tend to avoid talking, reading, and listening about the disease, presumably as a way of avoiding stress and negative thoughts that may manifest. Avoidance behaviors are a highly prevalent symptom and a major factor in maintaining anxiety (40).

RESULTS

In this study, the perception (of illness, control, and cause) and avoidance behaviors subscales were used to measure the perceptions and attitudes of students who received medical education in the 2021-2022 academic year toward the COVID-19 pandemic. The reliability of the scales was 84.7% and 83.9%, respectively.

When the smoking status of the participants was evaluated, it was concluded that the sixth-year students smoked the most at 30%, and the relevant distributions are given in Table 3. The perceptions and avoidance behaviors scores of the participants according to smoking status, gender, and whether they or a relative had COVID-19 are given in Table 4. While there was no significant difference in perception of cause (p=0.18) and avoidance behaviors (p=0.832), it was concluded that the perception of disease (p=0.006) and the perception of control (p=0.023), which are the subscales, differ between smokers and non-smokers. With the findings obtained, it was concluded that the perception of the disease and control was higher in smokers, and hypothesis H4, "There is no significant difference between the disease perception of smoking and non-smoking students", was rejected.

According to Table 4, in the comparison between individuals who have had COVID-19 and individuals who have not, there was no difference between avoidance behaviors (p=0.778), but a statistically significant difference was found between perception scores. It was concluded that the sub-dimensions of the perception of illness (p<0.001), the perception of cause (p=0.019), and the perception of control (p=0.021) were higher in those who had COVID-19. It is seen that students who had COVID-19 had a higher tendency to attribute the pandemic to an alternative reason, with the highest mean scores being in the conspiracy subgroup (Table 5). A statistically significant difference was found in the avoidance behaviors of individuals whose relatives had COVID-19 and those whose did not (p=0.035) while there was no difference in the perception of the disease (p=0.198), perception of cause (p=0.393), and perception of control (p=0.785) subscales. It was concluded that the students with a relative who had COVID-19 had higher scores in avoidance behaviors. With these findings, hypothesis H3, "There is no significant difference between the students who experienced the disease (themselves or through a relative) and those who did not according to their avoidance behaviors", was rejected.

When the statistical analysis results were evaluated, the perception of disease (p=0.015) and avoidance behaviors (p=0.048) showed statistically significant differences according

Table 3. Smoking status according to academic grades.

	Smoking status	
	Smoker (n=69)	Non-smoker (n=302)
Grade 1	12 (15%)	68 (85%)
Grade 2	10 (14.7%)	58 (85.3%)
Grade 3	12 (16.4%)	61 (83.6%)
Grade 4	15 (20.3%)	59 (79.7%)
Grade 5	14 (25%)	42 (75%)
Grade 6	6 (30%)	14 (70%)
Total	69 (18.6%)	302 (81.4%)

Table 4. Scale score comparisons according to students' demographic characteristics.

		Perception of disease		Perception of cause		Perception of control		Avoidance behaviors	
		Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Gender	Female	3.20±0.45	0.015*	2.24±0.67	0.146	2.66±0.51	0.056	3.17±0.73	0.048*
	Male	3.32±0.45		2.13±0.64		2.77±0.57		3.00±0.84	
Had COVID-19	Yes	3.36±0.48	<0.001*	2.30±0.70	0.019*	2.77±0.56	0.021*	3.13±0.77	0.778
	No	3.16±0.41		2.14±0.63		2.64±0.50		3.10±0.77	
Smoker	Yes	3.37±0.47	0.006*	2.30±0.76	0.18	2.82±0.61	0.023*	3.09±0.83	0.832
	No	3.21±0.44		2.18±0.64		2.66±0.51		3.12±0.75	
Relatives had COVID-19	Yes	3.25±0.44	0.198	2.22±0.66	0.393	2.70±0.54	0.785	3.15±0.75	0.035*
	No	3.17±0.49		2.14±0.69		2.68±0.50		2.92±0.81	

Independent sample t-test, *p<0.05.
SD: Standard deviation, COVID-19: Coronavirus Disease of 2019

to gender. At the same time, there was no significant difference in the perception of causes (p=0.146) and the perception of control (p=0.056) subscales. It was concluded that although women's perception of illness was lower than men's, their avoidance behavior scores were higher. Considering this information, hypothesis H1, "There is no significant difference in the perception of the disease by gender", was rejected.

The comparison results of perception and attitude scores according to grades are given in Table 6. While it was statistically obtained that the scores of perception of disease (p=0.322) and perception of control (p=0.495) did not differ according to year levels. It was concluded that perception of cause (p<0.001) and avoidance behaviors (p=0.034) differed according to year levels. For the perception of cause subscale, post hoc analysis revealed a significant difference between the students in the pre-clinical and clinical years. The pre-clinical students (years 1, 2, and 3) had higher scores in the perception of the cause than the clinical students (years 4, 5, and 6) (p<0.001). The conspiracy, environment, and faith subgroups' mean scores are given in Table 7. According to the data obtained, first-, third-, and fifth-year students had higher scores in the conspiracy subgroup, and second-, fourth-, and sixth-year students' scores were higher in the environment subgroup. A significant difference was found in the avoidance behaviors subscale (p=0.034) according to grade levels. Post hoc analysis revealed that first-year students and second- and fourth-year students had significantly different scores in avoidance behaviors, and it was concluded that avoidance behaviors were more prevalent in second- and fourth-year students than first-year students. In light of this information obtained, hypothesis H2, "There is no significant difference between the academic years of the students for the perception subscales (disease, cause, control) of the COVID-19 disease", was rejected.

Table 5. Perception of cause sub-groups' comparison according to COVID-19 status.

		Conspiracy	Environment	Faith
		Mean ± SD	Mean ± SD	Mean ± SD
Had COVID-19	Yes	2.42±1.04	2.30±0.80	2.10±0.68
	No	2.12±0.84	2.24±0.76	1.98±0.67

SD: Standard deviation, COVID-19: The Coronavirus Disease of 2019

DISCUSSION

When the statistical analysis results were evaluated, the perception of disease (p=0.015) and avoidance behaviors (p=0.048) showed statistically significant differences according to gender. Although women's perception of disease was lower than men's, their avoidance behaviors were higher. It was concluded that male students perceived the disease as more dangerous than female students and that female students tended to avoid mediums and places where the disease is discussed more often. In a study conducted in the United

Table 6. Scale score comparisons according to students' grade levels.

	Perception of disease		Perception of cause		Perception of control		Avoidance behaviours	
	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value
Grade 1	3.30±0.43	0.322	2.42±0.67	<0.001*	2.73±0.62	0.495	2.91±0.71	0.034*
Grade 2	3.14±0.41		2.29±0.64		2.68±0.47		3.16±0.78	
Grade 3	3.25±0.54		2.31±0.74		2.76±0.64		3.12±0.80	
Grade 4	3.25±0.41		2.07±0.54		2.67±0.44		3.32±0.63	
Grade 5	3.27±0.40		1.97±0.63		2.66±0.40		3.10±0.86	
Grade 6	3.17±0.52		1.81±0.49		2.51±0.55		2.97±0.86	
Groups with significant difference			Grades 1, 2, 3 and, Grades 4, 5, 6				Grade 1 and, Grades 2, 4	

One-way ANOVA test, *p<0.05.
SD: Standard deviation

Table 7. Perception of cause sub-groups' comparison according to students' grades.

	Conspiracy	Environment	Faith
	Mean ± SD	Mean ± SD	Mean ± SD
Grade 1	2.54±0.91	2.43±0.81	2.17±0.84
Grade 2	2.36±0.93	2.37±0.71	1.98±0.68
Grade 3	2.40±1.01	2.32±0.87	2.16±0.70
Grade 4	1.93±0.78	2.23±0.70	2.00±0.53
Grade 5	2.03±0.93	1.98±0.70	1.92±0.48
Grade 6	1.80±0.78	1.96±0.65	1.59±0.50

SD: Standard deviation

States of America (USA), Wang et al. (26) observed that approximately 48% of the students experienced moderate-to-severe depression levels and approximately 38% experienced moderate-to-severe anxiety due to the COVID-19 pandemic. They found significant differences between genders in both parameters: females experienced both higher depression levels and anxiety (26). Some existing literature revealed female gender is associated with greater rates of anxiety, stress, and risk perception, while some studies found no correlation between gender and anxiety (41-43). Rana et al. (44) found that women had significantly more fear and worries about getting infected. In a study conducted on university students, Rodriguez-Besteiro et al. (45) also found that female gender was correlated with elevated risk perceptions. In conclusion, the current study contrasted similar studies on risk perceptions since statistical analysis found the feeling of danger to be higher in males. However, the statistical finding that female students practicing avoidance behaviors more prevalently may be related to females having higher anxiety, and stress (according to literature search) associated with COVID-19 (26, 31, 40-42).

A significant difference was not found between genders in the perception of control subscale (p=0.056) which meant that both genders had similar rates of trust in preventive measures. Contrasting the current study, regarding adherence and agreement to COVID-19 preventive measures according to gender, Galasso et al. (46) studied on 8 different countries with a total of 21,649 respondents in a two-wave survey in March and April 2020. The surveys revealed that agreement to preventive measures was higher in women in the first wave (46). In the second wave, agreement decreased among both females and males but the difference between genders persisted. The study also found a similar difference between genders in compliance with preventive measures, being higher in females (46). similarly, Rana et al. (44) found that women had more trust in government actions and measures regarding the pandemic and Ferrín et al. (47) found that females were more trusting of the efficiency of measures taken to avoid infection although they perceived the disease riskier than men.

While there was no difference in avoidance behaviors in the comparison between individuals who had COVID-19 and those who did not (p=0.778), a statistically significant difference was found between perception scores. It was concluded that the subscales, perception of illness (p<0.001), perception of causes (p=0.019), and perception of control (p=0.021) were all higher in those who had COVID-19. Therefore, students who had COVID-19 at some point viewed the disease as more dangerous and thought there could have been an alternative reason for the disease rather than traditional views, although they had higher trust in personal and mandated and prevention techniques' reliability. Cipolletta et al. (48) states that high-risk perception encourages preventive behaviors, which correlates with the finding that students who had COVID-19 perceive the disease to be more dangerous while they have more trust in preventive measures. Further analysis revealed that participants who had the disease believed in conspiratorial reasons more prevalently (Table 7). Zhang et al. (49) found increased rates of depression related to the pandemic in patients who had COVID-19. Therefore, higher scores in perception of the disease, which means a higher perception of danger, could potentially be related to higher anxiety, stress, and depression. In a study conducted in Türkiye by Fenercioglu et al. (50), it was found that 50.1% of the population had beliefs of conspiracy about the COVID-19 pandemic. However, a correlation between conspiratorial beliefs and past COVID-19 infection was not detected, while the current study found a significant difference in the perception of causes related to COVID-19 infection (50). Regarding the finding of a higher perception of control in students who have had COVID-19, Wong et al. (51) found that higher anxiety was associated with increased use of preventive measures, Ahorsu et al. (52) found an indirect association between health status and preventive behaviors via fear of COVID-19, and Taghrir et al. (53) found that as preventive behaviors increased, the risk perception declined in medical students in Iran. Considering health and fear of how dangerous a disease can be are driving factors to adherence to preventive measures, the findings are consistent with existing literature, and it can be concluded that having COVID-19 at some point causes feeling of danger regarding the disease to be higher and therefore elevates the rates of agreement to preventive measures.

Contrasting personally experiencing COVID-19 infection, relatives having COVID-19 were not found to be significant in perception sub-scales but were a significant factor in avoidance behaviors. A statistically significant difference was found in the avoidance behaviors of participants whose relatives had COVID-19 (p=0.035). Analysis revealed a higher rate of avoidance behaviors in participants who had a relative with COVID-19. Lee et al. (54) found that 20% of the students who participated in the study worried about their loved ones regarding the pandemic, while 31.8% of the students said the need to take care of their family affected their current and future plans. Tee et al. (41) found that female gender, being a student, and concerns for family were significantly associated with greater rates of anxiety and stress regarding the COVID-19 pandemic. Cao et al. (43) found gender not to be significant in anxiety, while having a relative or acquaintance infected with COVID-19 was related to higher anxiety. In another study, it was also found that medical students who had a relative infected with COVID-19 had higher positive responses to preventive practices (55). These findings correlate with higher avoidance behaviors in students with infected relatives since avoidance behaviors are a direct symptom of anxiety and literature search suggests that having a loved one diagnosed with COVID-19 increases anxiety (40, 41, 43). Avoidance behaviors could be an attempt to dam negative thoughts and not increase stress while dealing with the anxiety of having a loved one affected. Considering the finding that self-COVID-19 infection was not found to be significant in avoidance behaviors while avoidance behaviors were positively correlated with having a loved one with COVID-19 infection further supports the notion that people were generally more

worried about their loved ones rather than themselves during the pandemic. In conclusion, while personally experiencing COVID-19 infection caused the feeling of danger to be higher and, encouraged people to practice preventive techniques, having a relative infected with COVID-19 did not. Still, it rather pushed people to have avoidance behaviors presumably as an effect of anxiety.

It was found that the perception of disease (p=0.006) and the perception of control (p=0.023) differ between smokers and non-smokers. It was concluded that both scores of smokers were higher, meaning that smokers perceived the disease to be more dangerous than non-smokers and that they had higher trust in personal and mandated preventive measures. In a study done on adults residing in Jordan, Nusair et al. (42) found that female gender and being a smoker were correlated with elevated risk perception scores. White et al. (56) found that in the United States, most smokers (63.7%) believed that they had a higher risk regarding COVID-19, while Nyman et al. (57) stated that in the United States, 43.6% of smokers felt that smoking could increase the severity of COVID-19. In Hong Kong, Li et al. (58) found that the overall prevalence of high perceived susceptibility to and severity of COVID-19 in relation to smoking was 23.9% and 41.7%, respectively. Therefore, the finding of a higher perception of disease in smokers in the current study is supported by several similar studies, and it correlates with higher trust and potential adherence to preventive measures.

It was found that pre-clinical students' scores were higher than clinical students' scores in the perception of causes subscale (p<0.001), meaning that pre-clinical students were more inclined to believe alternative theories when it comes to what caused the pandemic. This difference may stem from clinical students' more advanced knowledge of the field of medicine, causing them to be more skeptical of unconfirmed information, although it is not possible to say certainly considering it is out of the scope of the current questionnaire.

It was found that second- and fourth-year students' avoidance behaviors were significantly higher than first-year students' (p=0.034). Higher scores of avoidance behaviors in second- and fourth-year students could be explained by the literature finding that upper-grade students experience more anxiety and hopelessness regarding the pandemic but this finding causes some uncertainty since there were no significant difference detected between first-, third-, fifth- and sixth-year students (35).

No significant difference was found between grades regarding the perception of disease (p=0.322) and the perception of control (p=0.495) sub-scales. There was no correlation between grade levels and feelings of danger or trust in preventive measures.

Considering the findings obtained and mentioned above, it has been determined that COVID-19 affects students in terms of social isolation and anxiety. In addition, it is seen that it negatively affects students' social and educational lives. It is predicted that the COVID-19 pandemic, which affects human life in psycho-social terms worldwide, will also affect the students' academic lives. For example, in a study conducted in the USA during the pandemic, it was stated that social isolation and economic uncertainty lead to mental difficulties such as loneliness, anxiety, and depression, and it was observed that the psychological resilience of individuals forming society decreased significantly compared to normal conditions (59). Another study conducted on medical students in the United States found that 67.5% of the participant students pointed out that they were exposed to increased depression, and 73% of them were exposed to increased feelings of anxiety (60). It was also found that 81% of medical students thought they had less control over their medical skills, and 70.9% thought that they were less competent in medical fields than previous medical students who did not go through a pandemic during their education (60). It has been reported that 70% of the students think that their general education quality has decreased due to the measures regarding the pandemic, and a significant number of students think that their clinical experience is insufficient (60).

This study has limitations in conducting the research with sample and cross-sectional data. These limitations should be considered when evaluating the results.

CONCLUSION

The statistical analysis results revealed the different perceptions and attitudes of medical students, which are important to grasp the aftermath of the COVID-19 pandemic fully. The results were compared with existing literature to further investigate the reasons behind certain perceptions and attitudes, which are vital to understanding psychological and social reflections of the recent COVID-19 pandemic and a potential future pandemic. This study may also contribute to future studies.

Ethics Committee Approval: *This study was approved by Başkent University Institutional Review Board (date: 01.02.2022, decision number: KA22/51).*

Informed Consent: *Informed consent was obtained from all of the participants.*

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