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RESEARCH ARTICLE

COVID-19 Awareness and Educational Challenges Among Dental Students in Turkey

Türkiye'de Diş Hekimliği Öğrencileri Arasında COVID-19 Farkındalığı ve Eğitimsel Zorluklar

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ABSTRACT

Objective: This study aims to evaluate the perceptions, knowledge, and awareness levels of dental students in Turkey regarding COVID-19, with a focus on infection control practices and the impact of distance learning on clinical competency.

Methods: This cross-sectional online survey was conducted among 4th- and 5th-year dental students across Turkey through the Turkish Dental Association. A total of 510 students participated. The questionnaire consisted of 37 items assessing demographic characteristics, knowledge of COVID-19 symptoms and transmission routes, infection control measures, and experiences with distance education.

Results: Students demonstrated high awareness of COVID-19 transmission routes and preventive measures. However, significant knowledge gaps were observed regarding the incubation period, surface disinfection protocols, and post-exposure procedures. Most students reported increased anxiety due to the uncertainty caused by the pandemic, and over half stated that distance education was inadequate for acquiring clinical skills.

Conclusion: Although dental students possessed sufficient theoretical knowledge about COVID-19, deficiencies in practical preparedness and crisis management highlight the need to integrate hands-on training and pandemic-focused content into the dental curriculum.

Keywords: COVID-19, dental students, infection control, distance learning, awareness, psychological impact

ÖZET

Amaç: Bu çalışma, Türkiye'deki diş hekimliği öğrencilerinin COVID-19'a yönelik algı, bilgi ve farkındalık düzeylerini; enfeksiyon kontrol uygulamaları ve uzaktan eğitimin klinik yeterlilik üzerindeki etkisi bağlamında değerlendirmeyi amaçlamaktadır.

Yöntem: Kesitsel tasarıma sahip bu çevrim içi anket çalışması, Türk Dişhekimleri Birliği aracılığıyla Türkiye genelinde 4. ve 5. sınıf diş hekimliği öğrencilerine uygulanmıştır. Toplam 510 öğrenci katılım göstermiştir. Anket formu, demografik bilgiler, COVID-19 semptomları, bulaşma yolları, enfeksiyon kontrol önlemleri ve uzaktan eğitim deneyimlerini değerlendiren 37 sorudan oluşmuştur.

Bulgular: Öğrenciler COVID-19'un bulaşma yolları ve koruyucu önlemleri konusunda yüksek farkındalık sergilemiştir. Ancak inkübasyon süresi, yüzey dezenfeksiyonu protokolleri ve maruziyet sonrası prosedürler gibi konularda önemli bilgi eksiklikleri gözlenmiştir. Öğrencilerin çoğu, pandeminin yarattığı belirsizlik nedeniyle kaygı düzeylerinin arttığını belirtmiş ve yarısından fazlası uzaktan eğitimin klinik beceri kazandırmada yetersiz olduğunu ifade etmiştir.

Sonuç: Diş hekimliği öğrencilerinin COVID-19'a dair teorik bilgi düzeyleri yeterli olsa da pratik hazırlık ve kriz yönetimi konularındaki eksiklikler, uygulamalı eğitimlerin ve pandemi yanıtı odaklı içeriklerin müfredata entegre edilmesinin önemini ortaya koymaktadır.

Anahtar Kelimeler: COVID-19, diş hekimliği öğrencileri, enfeksiyon kontrolü, uzaktan eğitim, farkındalık, psikolojik etki

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INTRODUCTION

A new coronavirus emerged in late 2019, rapidly spread and evolved into a global pandemic, affecting all areas of social life. This virus impacted not only healthcare systems but also educational systems worldwide. Dental students were among the most directly affected groups due to close contact involved in clinical training and patient care. The infection was named "Coronavirus Disease 2019" (COVID-19) by the WHO in February 2020.[1] Measures taken to prevent the spread of COVID-19 significantly limited the clinical participation of fourth- and fifth-year dental students, causing serious consequences for the development of their professional skills. Interruptions in clinical training hindered both the acquisition of practical skills and the transfer of infection control practices to students. Early in the pandemic, the Turkish Ministry of Health restricted dental services to urgent cases.[2]

The close contact and aerosol-generating rotary instruments, and intraoral procedures release droplets, making dental clinics high-risk environments.[3,4] These aerosol particles can expose healthcare workers and other patients via inhalation. Such risk factors pose a greater threat in university-based dental faculties. During their clinical training, fourth- and fifth-year students are in close contact with patients for oral examinations and treatments. Moreover, their limited experience with infection control procedures makes them vulnerable to contagious diseases. Following the first confirmed case of COVID-19 in Turkey on March 10, 2020, the Turkish Council of Higher Education (YÖK) suspended in-person education on March 26, transitioning to a distance learning model.[5]

The remote education transition brought academic and professional challenges for clinical- phase students deprived of hands-on experience, adversely affecting their skill development. A review of the literature on dental students' knowledge, awareness, and perceptions during the COVID-19 period revealed that a limited number of studies have addressed this topic.[6-9]

This study aims to evaluate the perceptions of dental students across Turkey during the COVID-19 pandemic, their level of knowledge regarding infection control in post-graduation private practice, and the effects of distance education—especially on fourth- and fifth-year students who were deprived of clinical practice.

MATERIALS AND METHODS

This cross-sectional survey study was approved by the Non-Interventional Ethics Committee of Kırıkkale University (24.06.2020, Decision No: 2020.06.13). A 37-item online questionnaire was administered via Google Forms and distributed to fourth- and fifth-year dental students across Turkey through the Turkish Dental Association (TDA). This distribution ensured participation from all seven geographical regions, confirming national representativeness. During the study period, students were receiving remote education. Questionnaire design was based on American Dental Association (ADA), the Centers for Disease Control and Prevention (CDC), and WHO guidelines and literature on COVID-19's impact on healthcare students.

Before participation, informed consent was obtained; only voluntary respondents proceeded. The form specified inclusion of fourth- and fifth-year dental students and emphasized one-time participation. The survey evaluated sociodemographic characteristics, COVID-19 knowledge, infection control practices, and distance education perceptions. No personal data were collected, and confidentiality was assured via informed consent.

Statistical Analysis

The study included fourth- and fifth-year students from all dental faculties across Turkey. The sample size was calculated using a prevalence rate of 0.05, a 95% confidence interval (t = 1.96), and a 0.05 margin of error, yielding a minimum of 365 participants.

Data analysis utilized IBM SPSS software. Comparisons between two groups were performed using Student's t-test or Mann–Whitney U test, and three or more groups used ANOVA or Kruskal–Wallis H test. $p < 0.05$ was considered statistically significant.

RESULTS

In total, 510 fourth- and fifth-year dental students participated. The participants' ages ranged from 20 to 32 years, with 65.7% identifying as female and 34.3% as male; 54.9% were fourth-year and 45.1% fifth- year students (Table 1).

28.4% followed daily COVID-19 updates, 73.9% reported having sufficient knowledge, but 16.5% gave incorrect answers regarding the virus's scientific name.

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Table 1. Demographic characteristics of 510 participating dental students

Variable	Category	Number (n)	Percentage
Gender	Female	335	65,7%
	Male	175	34,3%
Year of Study	4th Year	280	54,9%
	5th Year	230	45,1%
Age Groups	21 years and under	65	12,7%
	22-24 years	399	78,2%
	25 years and older	46	9,0%

Table 2. Additional Key Findings (n = 510)

Survey Question	Most Common Response	n	%
Whom to contact after unprotected exposure	Correct answer	67	13.1
Required waiting time after surface disinfection	Correct answer	45	8.9
Understanding of virus incubation period	Incorrect answer	312	61.2
Access to simulation/practical support in distance education	Reported no access	383	75.1
Distance education beneficial for practical knowledge	Reported not beneficial	235	46.1
Pandemic uncertainty caused anxiety about future	Agreed / Strongly agreed	443	86.8
Impact of the pandemic on daily life	Reported being very or extremely affected	389	76.1
Correct order of donning and doffing PPE	Correct donning and doffing sequence known	311	61.0
Pre-procedural antimicrobial mouth rinse reduces viral load	Correct answer	377	73.9
Knowledge of long-term N95/FFP2 mask use	Correct understanding (mask reuse ≤ 8h and avoiding contamination)	367	72.0

Over 90% of the students correctly stated COVID-19 transmission routes, but knowledge gaps remained regarding environmental stability and infectious period. Specifically, 27.5% of students answered incorrectly on this topic, and 61.2% lacked knowledge about the incubation period.

The majority of participants indicated that wearing N95/FFP2 masks during all dental procedures is essential. However, 26.1% believed that the use of antimicrobial mouth rinses (e.g., 1.5% hydrogen peroxide or 0.2% povidone-iodine solutions) prior to treatment is not effective in reducing viral load in the oral cavity. Most correctly stated the PPE sequence, and 87.6% knew that isolation for asymptomatic cases ends on day.[14]

However, only 8.9% knew a one-minute wait is required after 70% alcohol disinfection, and 18.8% erred on extended N95/FFP2 mask use, revealing knowledge gaps.

Regarding radiographic preferences during COVID-19, 81.8% chose panoramic radiography— indicating preference for low-contact imaging. Other choices included CT (32.7%), cephalometric (22.4%), periapical (16.5%), and occlusal film (7.8%).

When asked about the pandemic's effect on their daily lives, 30% were highly affected, while 5.6% reported not being affected at all. Concerns about the future were commonly reported: 48.2% of students selected "strongly agree," and 36.9% selected "agree" that the uncertainty during the pandemic caused significant anxiety about their future.

Furthermore, 80.8% reported the feeling of uncertainty was the most influential factor affecting them during the pandemic, whereas concerns about diminished manual skills were comparatively lower. In fact, 41.4% reported being only minimally affected in this regard. In response to the question, "Do you believe the pandemic will end in the next three months?", 44.5% answered "not at all," and 28.2% answered "very little."

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While 17.6% viewed COVID-19 as highly dangerous to themselves and their families, 2.3% saw no danger. When faced with a sneezing/coughing patient, 36.3% would refer the patient to a pandemic hospital, 35.7% would treat with protection and refer later, and 19.2% would ask them to return after testing negative.

Notably, only 13.1% knew whom to contact after unprotected exposure, revealing a serious lack of knowledge in crisis and post-exposure management.

When students' opinions regarding distance education were evaluated, only 24.9% received courses with practical tools such as hands-on exercises, simulations, or 3D modeling. 46.1% said distance education did not contribute at all to the development of practical skills; only 2.5% reported benefiting significantly (Table 2).

Only 7.8% found distance education "completely effective," while 20% agreed with this statement. In contrast, 33.1% were "neutral," 23.5% "disagreed," and 15.5% "strongly disagreed" (Figure 1).

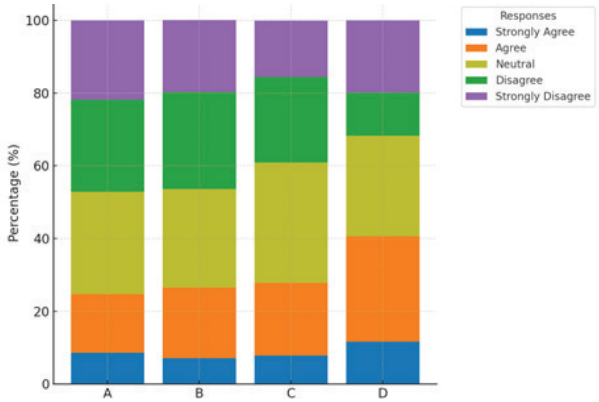

Figure 1. Perceptions of dental students on the effectiveness and adaptation of distance education during the COVID-19 pandemic. Responses to four statements regarding distance education (A–D) are presented as percentages.

A: Distance education has offered enhanced learning opportunities compared to traditional learning methods.

B: Participants' opinions on whether distance education improved quality and efficiency during the suspension of education.

C: During this pandemic period, the implementation of distance education has been very effective for me.

D: If the pandemic persists for an extended period, conducting training and examinations for internships and graduation on phantoms or through online platforms may provide a safer alternative.

These findings indicate that most students did not find the distance education beneficial and suggest that this educational model is inadequate, particularly in practice-based fields like dentistry.

DISCUSSION

In dental faculties across Turkey, students typically begin clinical practice in their fourth and fifth years. This phase is critical, as it represents the transition from theoretical knowledge to hands-on experience and involves increased direct contact with patients. During this period, students who lack full proficiency in infection control protocols are more vulnerable to highly contagious diseases such as COVID-19.

The COVID-19 pandemic affected students' health as well as their academic, psychological, and social lives.[10,11] Dental students starting clinical practice experienced anxiety due to patient contact and the risk of transmission, both for themselves and those around them.

The findings of this study demonstrate that COVID-19 had psychological effects on dental students. The majority of participants reported experiencing anxiety about their future due to pandemic-related uncertainty. This result aligns with a previous study from China, where approximately 24.9% of university students reported experiencing anxiety related to COVID- 19[10]. Similarly, in the present study, over 80% of students reported the uncertainty of the pandemic had psychological impacts and that the disruption in education threatened their professional development. This finding is further supported by recent Turkish literature which similarly observed elevated fear and anxiety levels among dental undergraduates during the pandemic.[11]

The suspension of in-person education and the transition to online learning during the pandemic resulted in students being deprived of hands-on training. This can be considered a significant loss, particularly in the development of clinical skills. Over half of the participants reported that distance education failed to provide adequate practical skills, indicating insufficient use of alternative teaching methods such as simulation, virtual reality, and 3D modeling during the pandemic. This shortcoming was strongly felt by students. This practical deficiency accelerated the global adoption of high-fidelity simulation and Virtual Reality (VR), validating the need for these tools as permanent, compulsory components of the modern dental curriculum.

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Most students across Turkey correctly answered questions related to the correct sequence of donning and doffing personal protective equipment (PPE). This suggests a high level of awareness regarding infection control protocols. A similar study reported that 79.6% of Iranian medical students had accurate knowledge of procedures using N95 masks.[12] In comparison, this study found a higher rate at 89.2%. This difference may be attributed to the nature of dental education, which involves intensive training in aerosol-generating clinical environments, making PPE usage particularly critical. This high awareness confirms that the stringent use of N95/FFP2 masks and enhanced aerosol control have become a permanent and mandatory standard in post-pandemic clinical practice.

A particularly concerning finding is that only 14.3% of students correctly indicated who they should contact after unprotected exposure to a patient who was confirmed or suspected to have COVID-19. This highlights a significant gap in knowledge regarding crisis management and post-exposure protocols. This severe gap confirms that traditional infection control is insufficient; it mandates a permanent curricular shift towards mandatory Disaster and Pandemic Preparedness modules to ensure graduates are ready for high-risk systemic crises. In this context, infection control education related to COVID-19 should not be limited to theoretical instruction; rather, it should be reinforced through case-based learning and guideline reviews to ensure practical competence among students.

Specifically, it is recommended that in the "Guidelines for Working in Healthcare Facilities and Infection Control Measures During the COVID-19 Pandemic" published by the Turkish Ministry of Health, be integrated into dental school curricula.[13] This integration could ensure that students are adequately prepared both in terms of knowledge and clinical application.

Since SARS-CoV-2 is found in saliva, national and international guidelines recommend antimicrobial mouth rinses before and after treatment.[14-16] However, a single preprocedural rinse is not enough due to continuous salivary flow. However, in this study, 22.6% of students believed that mouth rinses do not reduce viral transmission, which indicates a knowledge gap in fundamental aspects of infection control.

Frequent handwashing is one of the most basic yet essential measures for protecting against COVID-19.[17] A previous study conducted among Turkish medical students reported that 86.7% were aware of the importance of regular hand hygiene.[18] Similarly, in our study, 87.1% of dental students acknowledged its importance, reflecting the effectiveness of public health education campaigns since the beginning of the pandemic.

Regarding the extended use of N95/FFP2 masks, 20.1% of participants believed these could be worn 10 times or more under appropriate conditions likely due to the limited availability and high cost during the survey period. This underscores the need for universities to address PPE accessibility in pandemic planning.

In a previous study conducted with practicing dentists, individuals with clinical experience were found to exhibit greater confidence in infection control measures related to COVID-19.[19] Similarly, an international review reported that although dental students worldwide generally possess adequate knowledge of COVID-19 transmission and infection control, they often lack sufficient confidence in managing real-life clinical situations. The review further emphasized that most students obtain their information from informal sources such as social media, underscoring the need to systematically integrate infection control and disaster preparedness education into dental curricula.[20] Consistent with these findings, the students in the present study demonstrated comparable levels of theoretical knowledge but appeared less prepared to make appropriate decisions in crisis situations. This underlines once again the critical role of hands-on training in dental education.

The COVID-19 pandemic posed significant challenges, particularly for final-year students. Online graduation ceremonies, uncertainty in educational planning, and the suspension of clinical practice courses adversely affected their academic and professional motivation. While distance learning has provided continuity for theoretical courses, it has proven insufficient for the practical aspects of dental education.

During the pandemic, all dental schools in Turkey were forced to transition from face-to-face to online learning. However, given that students were unfamiliar with this model and the existing literature on this topic in Turkey is scarce, this study also aimed to evaluate the impact of distance learning on students.[19,21,22] For remote education to be effective, students must have access to the internet, appropriate technological devices, and digital literacy—resources that may not be equitably available to all. Moreover, the isolation associated with home-based learning has had negative psychological and motivational effects on students.

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In a study conducted with dental students in Pakistan, the majority of participants reported experiencing moderate to high levels of stress during the COVID-19 period, which adversely affected their emotional, physical, and cognitive well-being.[23] This underscores the importance of maintaining self-motivation among students during such crises. Similarly, in our study, students' views on the effectiveness of distance education were largely unfavorable. Only 2.5% of participants found remote education to be "very useful," while 7.6% found it "useful." These results indicate that remote education did not meet the students' expectations in terms of effectiveness.

The dental profession requires advanced practical and motor skills; therefore, in addition to face-to-face education, students should be supported with hands-on training, simulations, and 3D visualization techniques. However, the results of this study indicate that only 23.7% of students reported receiving such courses. The fact that a significant majority lacked access to these educational tools presents a considerable risk, particularly for students who graduated during the pandemic. This gap may contribute to weakened clinical competence, difficulties in securing employment, and a lack of professional confidence.

A significant limitation is the temporal nature of the data, collected during the initial phase of the COVID-19 pandemic (March–June 2020). This period was defined by maximum public health uncertainty and the complete suspension of clinical education. While the results offer a unique "snapshot" of students' initial crisis response and unpreparedness, current attitudes and knowledge may have improved as clinical protocols and educational models have since stabilized. Future research should compare these baseline crisis perceptions with post-pandemic data.

CONCLUSION

This study revealed that dental students generally have adequate knowledge of COVID-19 symptoms, transmission routes, and basic infection control. However, gaps remain in key areas such as incubation period, surface disinfection, and emergency protocols. Furthermore, the uncertainty brought on by the pandemic has led to significant future-related anxiety among students. The lack of practical training during remote learning has become a major source of concern regarding their clinical preparedness.

These findings urgently mandate that dental faculties transform the curriculum to be resilient to public health crises. To enhance the competence of future graduates, concrete steps must be taken: The mandatory integration of a case-based Disasters and Pandemics Preparedness module to address the knowledge deficit in emergency protocols, and the permanent and compulsory incorporation of Virtual Reality (VR) and simulation techniques into clinical phases to bridge the practical skill gap are of vital importance. Additionally, the teaching of procedures where knowledge deficits were identified must be standardized in alignment with official guidelines and strictly enforced in clinical practice.

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