EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

RESEARCH ARTICLE

Evaluation of the Knowledge Level of Dentistry Faculty Students on Cross-Infection Control

Diş Hekimliği Fakültesi Öğrencilerinin Çapraz Enfeksiyon Kontrolü Konusundaki Bilgi Düzeylerinin Değerlendirilmesi

Neşe Oral[1], Şükran Ayran[2], Selma Ece Karabıyıkoğlu[2], Hilal Peker Öztürk[2], H. Aykut Özyiğit[3]

[1]Cappadocia University Faculty of Dentistry, Nevşehir, Türkiye

[2]University of Health Sciences Gülhane Faculty of Dentistry, Ankara, Türkiye

[3]University of Kyrenia Faculty of Dentistry, Girne, Kuzey Kıbrıs

ABSTRACT

Objective: Cross-infection in dentistry poses significant public health risks due to the transmission of pathogens among patients, dental professionals, and clinical environments. This study aimed to evaluate the knowledge level of dental faculty students regarding cross-infection control measures.

Materials and Methods: Ethical approval was obtained from the Gülhane Scientific Research Ethics Committee (Approval No. 2024/300). An online survey, developed based on prior research and piloted for validity, was distributed to students from two dental faculties. The survey assessed knowledge of cross-infection control measures, and data were analyzed using SPSS for Windows Ver. 29.0.

Results: The study included 483 participants (39.3% male, 60.7% female; mean age: 21.57 years). Correct response rates improved with educational level, with clinical students outperforming preclinical students across most survey categories ($p \leq 0.05$). Specific gaps were noted in knowledge of aerosol transmission, surface disinfection, and protective measures.

Conclusion: The study highlights the critical role of comprehensive educational programs in improving knowledge and adherence to cross-infection protocols. Emphasizing practical training alongside theoretical knowledge is essential for preparing dental students to effectively implement infection control measures.

Keywords: Cross-infection, dental education, infection control, public health, survey.

ÖZET

Amaç: Diş hekimliğinde çapraz enfeksiyon, patojenlerin hastalar, diş hekimi profesyonelleri ve klinik ortamlar arasında iletilmesi nedeniyle önemli halk sağlığı riskleri oluşturmaktadır. Bu çalışmanın amacı, diş hekimliği fakültesi öğrencilerinin çapraz enfeksiyon kontrol önlemleri konusundaki bilgi düzeylerini değerlendirmektir.

Gereç ve Yöntemler: Etik onay, Gülhane Bilimsel Araştırmalar Etik Kurulu'ndan (Onay No. 2024/300) alınmıştır. Önceki araştırmalara dayanarak geliştirilen ve geçerliliği pilot uygulama ile test edilen çevrimiçi anket, iki diş hekimliği fakültesinden öğrencilere dağıtılmıştır. Anket, çapraz enfeksiyon kontrol önlemleri konusundaki bilgi düzeyini değerlendirmiş ve veriler SPSS for Windows Ver. 29.0 kullanılarak analiz edilmiştir.

Bulgular: Çalışmaya 483 katılımcı (39,3% erkek, 60,7% kadın; ortalama yaş: 21,57 yıl) dahil edilmiştir. Doğru cevap oranları, eğitim düzeyi ile artmış olup, klinik öğrenciler çoğu anket kategorisinde preklinik öğrencilere göre daha başarılı olmuştur ($p \leq 0,05$). Aerosol ile bulaş, yüzey dezenfeksiyonu ve koruyucu önlemler konularında belirli bilgi eksiklikleri tespit edilmiştir

Sonuç: Çalışma, çapraz enfeksiyon protokollerine yönelik bilgi ve uyumun artırılmasında kapsamlı eğitim programlarının kritik rolünü vurgulamaktadır. Teorik bilginin yanı sıra pratik eğitimin de vurgulanması, diş hekimi öğrencilerinin enfeksiyon kontrol önlemlerini etkin bir şekilde uygulamaya hazırlanmaları için önemlidir.

Anahtar Kelimeler: enfeksiyon kontrolü,diş hekimliği eğitimi,çapraz enfeksiyon,anket,halk sağlığı

Submission Date: November 26, 2024
Acceptance Date: December 14, 2024
Corresponding author: H. Aykut Özyiğit
Address: University of Kyrenia Faculty of Dentistry, Department of Dentomaxillofacial Surgery, Girne, KKTC
Phone: +905077964306
Email: aykut.ozyigit@kyrenia.edu.tr

Neşe Oral 0000-0003-2038-2897
Şükran Ayran 0009-0003-5988-2685
Selma Ece Karabıyıkoğlu 0009-0005-8505-3367
Hilal Peker Öztürk 0000-0003-4774-6232
H. Aykut Özyiğit 0009-0007-8488-6564

EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

INTRODUCTION

Cross-infection is a critical public health concern in dentistry due to the potential transmission of harmful pathogens among patients, dental professionals, and the clinical environment. This underscores the necessity for stringent adherence to infection control protocols to mitigate the risks posed by bacteria, viruses, and fungi. Such infections may occur through direct contact with blood, saliva, or body fluids, indirect contact via contaminated instruments or surfaces, or airborne transmission through aerosols generated during dental procedures.[1,2]

High-speed dental handpieces and ultrasonic scalers are significant contributors to aerosol production, which heightens the risk of pathogen dissemination.[3] To address this, effective infection control strategies include the use of personal protective equipment (PPE), sterilization of instruments, and regular surface disinfection. The COVID-19 pandemic has further emphasized the importance of these practices, particularly the use of high-volume evacuators and enhanced environmental disinfection measures.[4]

Comprehensive infection control measures are only as effective as their implementation, which necessitates continuous education and awareness among dental professionals.[1,5] While studies show that compliance with basic protocols such as hand hygiene and the use of PPE is relatively high, gaps persist in areas like aerosol management and advanced sterilization techniques.[3]

The purpose of this study is to assess the knowledge level of dental students regarding cross-infection control, identify gaps in their understanding, and evaluate the effectiveness of their educational programs. These findings aim to guide the enhancement of infection control training in dental education.

MATERIALS AND METHODS

This study received ethical approval from the Gülhane Scientific Research Ethics Committee (Approval No. 2024/300). Participation was voluntary, and informed consent was obtained electronically from all participants before the survey.

The study was conducted among undergraduate dental students from the University of Health Sciences Gülhane Faculty of Dentistry and Cappadocia University Faculty of Dentistry. A total of 483 students participated, representing all academic years.

Data were collected using an online survey tool (Google Forms), which allowed efficient and anonymous data collection. The survey was adapted from validated instruments used in previous studies.[6] It comprised demographic questions (e.g., age, gender, academic year) and 26 items assessing knowledge of cross-infection control measures. These questions covered topics such as PPE usage, disinfection and sterilization protocols, and infection prevention strategies.

A pilot test was conducted with 20 dental students to evaluate the survey's clarity and relevance. Based on participant feedback, minor adjustments were made to the survey format and content to ensure validity and ease of completion.

The final survey, which took approximately three minutes to complete, was distributed to participants via WhatsApp. The survey was administered in Turkish to align with the participants' native language. Personal identifying information was not collected to maintain confidentiality.

Data were analyzed using SPSS for Windows Ver. 29.0 (SPSS Inc., IL, USA). Descriptive statistics were calculated to summarize participant demographics and response frequencies. Since the data were categorical, normality tests were not required. A chi-square test was applied to assess differences between preclinical (1st–3rd year) and clinical (4th–5th year) student groups. Statistical significance was set at $p \leq 0.05$.

RESULTS

A total of 483 dental students participated in the study, with 190 (39.33%) male and 293 (60.67%) female students. The participants ranged in age from 18 to 38 years, with a mean age of 21.57 years. Table 1 details the distribution of participants by gender and academic year. Across all educational levels, the number of female participants exceeded that of males.

Table 1. Distribution and Percentage Graph of Female and Male Participants by Education Year (n, %)

Class	Female	Male	Total
1	70 (63.63%)	40 (36.37%)	110 (22.77%)
2	58 (59.18%)	40 (40.82%)	98 (20.28%)
3	68 (55.28%)	55 (44.72%)	123 (25.47%)
4	58 (62.36%)	35 (37.64%)	93 (19.25%)
5	39 (68.42%)	18 (31.58%)	57 (11.83%)
Total			483 (100%)

EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

Table 2. Number and percentage of correct and incorrect responses for Grades 1, 2, and 3, and Grades 4 and 5 (n, %)

Question	Grades 1, 2, 3 (331 responses)		Grades 4 and 5 (152 responses)		Total
	Correct	Incorrect	Correct	Incorrect	
5. What is the purpose of the infection control program?	252 (76.13%)	79 (23.87%)	141 (92.76%)	11 (7.24%)	483 (100%)
6. What diseases can be transmitted through cross-contamination to staff and patients?	250 (75.52%)	81 (24.48%)	143 (94.07%)	9 (5.93%)	483 (100%)
7. What is the risk of cross-contamination during dental examination?	241 (72.80%)	90 (27.20%)	146 (96.05%)	6 (3.95%)	483 (100%)
8. Can hands of staff and patients be contaminated with saliva after a dental examination?	256 (77.34%)	75 (22.66%)	147 (96.71%)	5 (3.29%)	483 (100%)
9. Can hands of staff and patients be contaminated with saliva after dental treatment?	258 (77.94%)	73 (22.06%)	146 (96.05%)	6 (3.95%)	483 (100%)
10. Should each clinic have its own written infection control protocols?	294 (88.82%)	37 (11.18%)	148 (97.36%)	4 (2.64%)	483 (100%)
11. Should standard precautions be applied to everyone as if they are infected and should infection control be implemented?	297 (89.73%)	34 (10.27%)	150 (98.68%)	2 (1.32%)	483 (100%)
12. Should disposable gloves be worn during all dental procedures?	296 (89.42%)	35 (10.58%)	149 (98.02%)	3 (1.98%)	483 (100%)
13. Should staff wear goggles, masks, or face shields if contact with body fluids is anticipated?	296 (89.42%)	35 (10.58%)	149 (98.02%)	3 (1.98%)	483 (100%)
14. What are clinical contact surfaces?	288 (87.01%)	43 (12.99%)	144 (94.73%)	8 (5.27%)	483 (100%)
15. Should barriers and surface disinfectants be used to prevent cross-contamination?	282 (85.20%)	49 (14.80%)	148 (97.37%)	4 (2.63%)	483 (100%)
16. What components should good surface disinfectants have?	233 (70.39%)	98 (29.61%)	129 (84.87%)	23 (15.13%)	483 (100%)
17. Are protective covers and single-use carriers an important step in radiographic infection control?	283 (85.50%)	48 (14.50%)	150 (98.68%)	2 (1.32%)	483 (100%)
18. Is sterilization of reusable instruments an important step in infection control?	301 (90.93%)	30 (9.07%)	148 (97.37%)	4 (2.63%)	483 (100%)
19. What is the risk of infection contamination in intraoral radiographs compared to extraoral radiographs?	265 (80.06%)	66 (19.94%)	143 (94.08%)	9 (5.92%)	483 (100%)
20. Is it necessary for dentists to take responsibility for infection control procedures?	263 (79.45%)	68 (20.55%)	141 (92.76%)	11 (7.24%)	483 (100%)
21. While barriers help in infection control, do they replace effective cleaning and disinfection?	251 (75.83%)	80 (24.17%)	137 (90.13%)	15 (9.87%)	483 (100%)
22. Should the chemical agent used by dentists for sterilization or disinfection be tuberculocidal and capable of preventing infectious diseases including HBV and HIV?	260 (78.55%)	71 (21.45%)	141 (92.76%)	11 (7.24%)	483 (100%)
23. Are dental professionals at higher risk of injuries leading to exposure to pathogens compared to other professions?	314 (94.86%)	17 (5.14%)	150 (98.68%)	2 (1.32%)	483 (100%)
24. Can a dentist protect themselves from cross-infection by taking a good medical history?	274 (82.78%)	57 (17.22%)	142 (93.42%)	10 (6.58%)	483 (100%)
25. Is it correct that infected or high-risk patients should be examined in the early hours of the day?	130 (39.27%)	201 (60.73%)	120 (78.95%)	32 (21.05%)	483 (100%)
26. Should air circulation systems be used or should the clinic be frequently ventilated, and should polish and polish motors be fitted with protectors during the treatment of infected or high-risk patients?	299 (90.33%)	32 (9.67%)	148 (97.37%)	4 (2.63%)	483 (100%)

EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

Participants were distributed across academic years as follows: 110 (22.77%) first-year students, 98 (20.28%) second-year students, 123 (25.46%) third-year students, 93 (19.25%) fourth-year students, and 57 (11.80%) fifth-year students.

Responses to survey questions were analyzed to compare the knowledge levels of preclinical (1st–3rd year) and clinical (4th–5th year) students. Table 2 summarizes the correct and incorrect responses for each question category. Clinical students consistently demonstrated higher correct response rates compared to preclinical students, with statistically significant differences noted across most categories ($p \leq 0.05$).

Awareness and Behavior (Questions 5, 20, 23, 24, and 25):

While clinical students exhibited higher correct response rates overall, Question 25 had the lowest correct response rate among both groups. This suggests a knowledge gap in managing high-risk patients during specific timeframes.

Cross-Infection Protocols (Questions 6, 7, 8, 9, 11, 17, and 19):

Clinical students outperformed preclinical students in this category. However, incorrect response rates for Questions 11, 17, and 19 were higher in both groups, highlighting areas requiring further reinforcement in infection prevention protocols.

Disinfection and Sterilization (Questions 10, 14, 15, 16, 18, 21, and 22):

While most students demonstrated adequate knowledge, Questions 16, 21, and 22 had higher incorrect response rates, particularly among preclinical students. This indicates challenges in comprehending and applying sterilization protocols.

Protecting Staff and Patients (Questions 12, 13, and 26):

Clinical students had a higher rate of correct responses compared to preclinical students. Incorrect responses in this category suggest that theoretical knowledge is retained more effectively when reinforced by clinical practice.

No statistically significant differences were observed between male and female participants regarding their knowledge of cross-infection control ($p > 0.05$).

The results demonstrate that knowledge levels improve as students progress through their education, particularly in clinical years where practical application complements theoretical learning. However, the data also reveal specific areas where knowledge gaps persist, underscoring the need for targeted educational interventions.

DISCUSSION

Cross-infection control is a critical aspect of dental practice, protecting both healthcare providers and patients from potential pathogen transmission.[5] This study evaluated the knowledge of dental students regarding cross-infection control, highlighting the relationship between their educational level and understanding of infection control protocols. The findings are consistent with previous studies, which have also emphasized the importance of education and practical training in improving infection control compliance among dental students.

The results indicate that clinical students (4th and 5th years) demonstrate significantly higher levels of knowledge compared to preclinical students (1st to 3rd years). This improvement aligns with the increased exposure to practical applications in clinical settings, which reinforce theoretical knowledge. Previous studies similarly report that hands-on experience enhances the retention and application of infection control measures.[3,7,13] However, significant knowledge gaps persist, particularly in areas such as aerosol control, surface disinfection, and sterilization techniques. Despite the overall adequacy of knowledge, several critical areas require improvement:

Aerosol Transmission: Questions related to the risks of aerosol production and its management had higher incorrect response rates, particularly among preclinical students. This aligns with studies emphasizing the need for targeted training on aerosol control in dental clinics.[4,8,11]

Sterilization and Disinfection: Challenges in understanding sterilization protocols were reflected in incorrect responses to questions about surface disinfectants and sterilization techniques. These findings underscore the need for repeated exposure to such topics through both theoretical instruction and practical demonstrations.[5,6,10]

Protective Measures: While knowledge of basic personal protective equipment (PPE) use was high, there were inconsistencies in understanding its application in specific scenarios, such as treating high-risk patients. This highlights the importance of situational training to bridge gaps between theoretical knowledge and practical application.[12,14]

EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

The study underscores the importance of the educational curriculum in shaping students' knowledge of infection control. Traditional didactic approaches alone may not suffice, as evidenced by the higher knowledge levels among clinical students who have engaged in hands-on learning. Integrating simulation-based learning and case-based discussions into preclinical years may enhance students' comprehension and retention of infection control protocols.[7,15]

Dental clinics are inherently high-risk environments for cross-infection due to the frequent generation of aerosols and the potential for contamination of instruments and surfaces. Effective infection control requires a multifaceted approach, including proper hand hygiene, use of PPE, sterilization of reusable instruments, and environmental disinfection.2,8 Dental education programs must continuously evolve to incorporate emerging evidence and updated guidelines, particularly in the wake of challenges like the COVID-19 pandemic.[4,9]

Further studies should explore the effectiveness of innovative teaching methods, such as virtual simulations and interprofessional training, in enhancing infection control knowledge. Longitudinal studies are also needed to assess how knowledge translates into practice after graduation. Moreover, education programs should prioritize practical demonstrations and continuous professional development to ensure that dental students are equipped to implement infection control measures effectively.[1,16]

To address the identified gaps, dental education programs should:

Place greater emphasis on practical training, particularly in early academic years.

Update curricula to include contemporary infection control guidelines, such as those developed during the COVID-19 pandemic.

Incorporate simulations and case-based learning to reinforce theoretical knowledge with practical applications.

Provide ongoing education and refresher courses for both preclinical and clinical students to ensure long-term retention of infection control protocols.

This study benefits from a large sample size and the inclusion of students from different academic years, allowing for a comprehensive analysis of knowledge trends. However, the use of a self-reported survey introduces potential biases, such as overestimation or underestimation of knowledge. Additionally, the survey's online format may have excluded students with limited internet access, potentially affecting the generalizability of the findings.

Further studies should explore the effectiveness of specific educational interventions in improving infection control knowledge. Longitudinal studies tracking knowledge retention and application from preclinical to clinical years could provide deeper insights into the impact of hands-on training. Additionally, qualitative research exploring students' perceptions of infection control education could help identify barriers to effective learning.

CONCLUSION

The findings of this study highlight the critical relationship between educational content and the knowledge levels of dental students regarding cross-infection control. As students advance through their education, their understanding and application of infection control protocols improve, particularly with the integration of clinical practice. However, persistent knowledge gaps in key areas, such as aerosol management and surface disinfection, emphasize the need for targeted enhancements in dental education programs.

To ensure comprehensive infection control training, dental curricula should prioritize the integration of theoretical knowledge with practical applications, particularly in the early stages of education. Regular updates to infection control protocols and ongoing education programs are essential for equipping students with the skills necessary to protect themselves and their patients.

By addressing these gaps and emphasizing hands-on training, dental education programs can play a pivotal role in reducing cross-infection risks and preparing future dental professionals to implement effective infection control measures confidently and consistently.

CLINICAL RELEVANCE

Scientific rationale: Evaluating students' knowledge provides valuable feedback on the effectiveness of the current curriculum and training programs. Principal findings: hands-on clinical experience influences students' understanding and implementation of infection control practices. Practical

EurAsian Journal of Oral and Maxillofacial Surgery
Official publication of AÇBİD (Association of Oral and Maxillofacial Surgery Society)

implications: Students who are well-informed are more likely to implement correct practices confidently and effectively in clinical settings, thereby reducing the risk of infection.

CONFLICTS OF INTEREST

The authors have no conflict of interests to declare.

ACKNOWLEDGMENTS

We thank Buğra ŞENEL for his support with the study.

REFERENCES

1. Ling ML, Ching P, Cheng J, et al. APSIC dental infection prevention and control (IPC) guidelines. Antimicrob Resist Infect Control. 2023;12(1), 53.
2. Amato A, Caggiano M, Amato M, Moccia G, Capunzo M, De Caro F. Infection control in dental practice during the COVID-19 pandemic. Int. J. Environ. Res. Public Health. 2020;17(13), 4769.
3. Albishi AKA, Muqbil BASB, Alzaqy HNH, Alqahtani RZA, Alharbi FRS, Al Otaibi BMA. Cross-infection and Infection Control in Dental Clinic: A Narrative Review. ACAM. 2022;9(4).
4. Aydındoğan S, Sayın Z, Marakoğlu İ. İzole bir dental klinikte ultrasonik skaler kullanımı sonrası oluşan aerosol kontaminasyonunun gözlenmesi. Selcuk Dental Journal. 2020; 7(3), 373-378.
5. CDC. Guidelines for infection control in dental health-care settings. Centers for Disease Control and Prevention. 2020.
6. Li X, Kang H, Wang S, et al. Knowledge, attitude, and behavior of hepatitis B virus infection among chinese dental interns. Hepat Mon. 2015;15(5):e25079.
7. Ahmed N, Shakoor M, Vohra F, et al. Knowledge, awareness and practice of health care professionals amid SARS-CoV-2, Corona Virus Disease Outbreak. Pak J Med Sci. 202;36(COVID19-S4):49-56
8. Harrel SK, Molinari J. Aerosols and splatter in dentistry: A brief review of the literature and infection control implications. Journal of the American Dental Association. 2004;135(4), 429-437.
9. Zemouri C, de Soet H, Crielaard W, Laheij A. A scoping review on bio-aerosols in healthcare and the dental environment. PLoS ONE. 2017;15(5), e0233301.
10. Otieno BO, Kihara EN, Mua BN. Infection control practices among private practicing dentists in Nairobi during the pre-coronavirus disease 2019 period. Frontiers in Oral Health. 2020;1, 587603.
11. Arısoy PDM. Diş hekimliğinde çapraz enfeksiyonlar ve kontrolü. A.Ü. Diş Hek. Fak. Derg. 2019;46(3), 187-195.
12. Smith A, Dickson M, Aitken J, Bagg J. Contaminated dental instruments. Journal of Hospital Infection. 2002;78(2), 103-111.
13. Harte JA. Standard and transmission-based precautions: an update for dentistry. The Journal of the American Dental Association. 2010;141(5), 572-581.
14. Pankhurst CL, Coulter WA. Basic guide to infection prevention and control in dentistry. West Sussex: John Wiley & Sons; 2017.
15. Devker NR, Mohitey J, Vibhute A, et al. A study to evaluate and compare the efficacy of preprocedural mouthrinsing and high volume evacuator attachment alone and in combination in reducing the amount of viable aerosols produced during ultrasonic scaling procedure. J Contemp Dent Pract. 2012;13(5), 681-689.
16. Garvin DA, Edmondson AC, Gino F. Is yours a learning organization?. Harvard business review. 2008;86(3), 109.