Evaluation of Dentists' Knowledge on Dental Management in Hemodialysis Patients

Diş Hekimlerinin Hemodiyaliz Hastalarında Dental Yaklaşıma Yönelik Bilgi Düzeylerinin Değerlendirilmesi

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ABSTRACT

INTRODUCTION: To determine knowledge levels of dentists, dental specialists, and dental students regarding dental approaches in hemodialysis patients.

METHODS: Recommendations for dental treatment of hemodialysis patients were identified by reviewing literature and guidelines from official organizations. Recommendations were translated from English to Turkish, reviewed, and revised by a committee. Survey containing eight questions was administered to 20 dentists, and feedback was collected. Survey was distributed digitally to participants as a link, demographic characteristics and education levels were recorded. Data were evaluated using descriptive analyses and chi-square test ($p<0.05$).

RESULTS: 314 individuals participated, including 193 general dentists, 39 specialists, and 82 dental students. The highest correct answers were for bleeding problems (87.9%) and infectious disease risk (87.3%). The most incorrect answers were on premedication (31.2%) and local anesthetic choice (58.3%). Students answered the prophylaxis question correctly more often than dentists and specialists ($p=0.000$), while dentists and specialists answered the infectious disease risk questions more accurately than students ($p=0.009$).

CONCLUSION: Dental curriculum and postgraduate programs should include current information on treating hemodialysis patients, and general dentists should participate in periodic training sessions.

Keywords: *Chronic kidney disease, hemodialisis, dental treatment, dentist*

ÖZ

GİRİŞ ve AMAÇ: Serbest ve uzman diş hekimleri ile diş hekimliği öğrencilerinin hemodiyaliz hastalarında dental yaklaşıma yönelik bilgi düzeylerinin belirlenmesi.

YÖNTEM ve GEREÇLER: Literatür ve resmi kuruluşların rehberleri incelenerek, hemodiyaliz hastalarının dental tedavilerine yönelik tavsiyeler belirlendi. Tavsiyeler İngilizceden Türkçeye çevrilerek bir kurul tarafından incelendi ve düzenlendi. Sekiz adet soru içeren anket 20 diş hekimine uygulandı ve geri bildirimler alındı. Anket dijital ortamda katılımcılara link olarak iletildi, demografik özellikleri ve eğitim düzeyleri kaydedildi. Veriler tanımlayıcı analizler ve ki-kare testi ile değerlendirildi ($p<0.05$).

BULGULAR: Çalışmaya toplam 193 diş hekimi, 39 uzman diş hekimi ve 82 diş hekimliği öğrencisi olmak üzere toplam 314 kişi katıldı. En yüksek oranda doğru yanıtlanan sorular kanama problemleri (%87,9) ve bulaşıcı hastalık riskine (%87,3) yönelikti. Katılımcılar en çok premedikasyon (%31,2) ve lokal anestezik tercihi (%58,3) konularında hatalı yanıtlar verdiler. Öğrencilerin profilaksiye yönelik soruya verdikleri doğru yanıtlar, serbest ve uzman diş hekimlerinden anlamlı şekilde yüksekti ($p=0.000$). Serbest ve uzman dişhekimleri ise bulaşıcı hastalık riskine yönelik soruları öğrencilere göre daha yüksek oranla doğru yanıtladılar ($p=0.009$).

SONUÇ: Diş hekimliği eğitim müfredatı ve mezuniyet sonrası eğitim programlarında hemodiyaliz tedavisi gören bireylerde dental tedavi yaklaşımına yönelik güncel bilgileri içeren eğitimlerin artırılması ve serbest diş hekimlerinin bu eğitimlere periyodik olarak katılması sağlanmalıdır.

Anahtar Kelimeler: *Kronik böbrek hastalığı, hemodiyaliz, dental tedavi, diş hekimi*

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INTRODUCTION

Chronic kidney disease (CKD) is a global public health concern, affecting around 10% of the population. It is characterized by a glomerular filtration rate (GFR) below 60 mL/min/1.73 m² for at least three months, along with structural or functional kidney abnormalities.[1] Given its progressive nature, some patients may require dialysis or kidney transplantation.[1] Hemodialysis, a medical procedure aimed at restoring impaired kidney function, plays a life-saving role in the management of advanced-stage CKD. During dialysis, blood circulation is accessed via an arteriovenous shunt or fistula, allowing excess fluids and metabolic waste to be removed from circulation through semipermeable membranes. However, since hemodialysis cannot fully replicate kidney function, patients often experience uremic syndrome and various systemic complications related to CKD and dialysis.[2] Uremic syndrome is a clinical condition primarily characterized by microangiopathic hemolytic anemia, thrombocytopenia, and acute kidney injury, and it is recognized as one of the leading causes of acute kidney injury, especially in pediatric patients.[2]

Oral manifestations associated with CKD and hemodialysis include pale mucosa, uremic stomatitis, petechiae, ecchymoses, gingival inflammation and hypertrophy, attachment loss, taste alterations, decreased salivary flow, spontaneous bleeding, hairy tongue, lichenoid reactions, mucosal ulcerations, angular cheilitis, and candidiasis.[3] Chronic periodontitis, commonly observed in adult hemodialysis patients, amplifies chronic inflammation, increasing the risk of cardiovascular disease and elevating CKD-related morbidity and mortality.[3-5] Invasive dental procedures in CKD patients are complicated by altered drug metabolism, immune dysfunction, bone metabolism changes, and increased risks of bleeding and infection. Timely oral examinations and regular dental check-ups are crucial for identifying potential infection foci, ensuring adequate oral hygiene, and improving disease prognosis.[3,6]

Hemodialysis patients, who frequently receive multiple blood transfusions, are at high risk for hepatitis B and C infections.[7,8] Although infective endocarditis is a relatively rare complication of hemodialysis, it remains a serious condition that must be taken into consideration.[7-9] While scientific evidence is insufficient to confirm that invasive dental procedures alone cause bacterial endocarditis, the immunosuppressive state and increased infection risk in hemodialysis patients warrant careful consideration of prophylactic antibiotic administration.[9-11] These patients are particularly prone to complications, including increased bleeding tendencies from anemia and anticoagulant therapy, elevated circulating nitrogenous compounds, and platelet function disorders.[12]

As the number of patients undergoing hemodialysis for chronic kidney disease increases, the number of CKD patients seeking dental care is expected to rise as well. Simple modifications in dental treatment planning and appropriate precautionary measures can significantly reduce the risk of disease- or procedure-related complications.[13] Precautions that dentists should consider in cases of cardiovascular diseases and immunosuppressive conditions have been addressed in both pre- and post-graduate education.[13] However, with ongoing advancements in the field, it is essential for dentists to remain informed on potential complications and best approaches for managing hemodialysis patients. This study aims to assess the knowledge of general dentists, dental specialists, and dental students regarding dental management of hemodialysis patients.

MATERIALS AND METHODS

The study protocol was approved by the Research Ethics Committees of the Faculty of Medicine, Ege University (16-3.2/8). Currently, no institution or organization has established official guidelines for the dental treatment of hemodialysis patients. Therefore, recommendations and guidelines for dental care in hemodialysis patients were established by reviewing the prophylactic recommendations of organizations such as the American Heart Association (AHA) for infective endocarditis, along with the existing dental and medical literature.[6-8,14-17] These recommendations and measures were translated from English to Turkish and then back into English to evaluate the consistency of the Turkish text with the original version. The comprehensibility and accessibility of the text were reviewed by a panel comprising 5 dental specialists, a bilingual individual fluent in both Turkish and English (a native English speaker), and 3 experts in Turkish Language and Literature. Based on their feedback, further refinements were made, resulting a survey that containing 8 questions on dental treatment timing, anesthetic use, premedication, antibiotic prophylaxis, and the risk of infectious diseases in hemodialysis patients. In a pilot study, the survey was administered to 20 dentists, and feedback was collected for its finalization. The questions were structured on a three-point scale: "Correct," "Don't know," and "Incorrect" and were distributed digitally via an online platform to general dentists, dental specialists, and final-year dental students in İzmir. The demographic characteristics and educational status of the participants were recorded. Differences in the knowledge levels of the participants were analyzed using descriptive statistical analyses and chi-square tests ($p<0.05$).

RESULTS

A total of 314 participants completed the survey, including 193 general dentists, 39 dental specialists, and 82 final-year dental students. The sample comprised 180 women (57.3%) and 134 men (42.7%), with ages ranging from 23 to 66 years (mean age = 27.7) (Table 1). Large proportion of the participants were aware of the potential bleeding problems during dental treatment in hemodialysis patients (87.9%) and the high risk of infectious diseases (87.3%) (Table 2). Seventy-eight percent of the participants answered that dental treatment should not be performed on dialysis days for hemodialysis patients. Similarly, 72.9% of the participants were aware that patients should not be on anticoagulants during dental treatment. When compared to dental specialist and students, the general dentists had significantly higher knowledge levels regarding the risk of infectious diseases (p=0.02) (Table 3). Fifty-eight point three percent of participants recognized that local anesthetics without adrenaline should be preferred for hemodialysis patients, while 58.9% were aware of the recommendation to avoid alcoholic mouthwashes.

Table 1. Distribution of participants based on gender and level of education

Gender	**n (%)**
Female	180 (57.3)
Male	134 (42.7)
Educational Status	
Dental student	82 (26.7)
General dentist	193 (60.8)
Dental specialist	39 (12.5)
Total	314 (100)

Table 2. Survey's content and participants' responses

	Correct Answer	**Correct n (%)**	**Don't know n (%)**	**Incorrect n (%)**
1. There is no harm in performing dental treatment on dialysis days.	Incorrect	40 (12.8)	29 (9.2)	**245 (78.0)**
2. Local anesthetics without adrenaline should be used.	Correct	**183 (58.3)**	26 (8.3)	105 (33.4)
3. Diazepam can be used for premedication.	Correct	**98 (31.2)**	110 (35.0)	106 (33.8)
4. Alcohol-based mouth rinses should be used for oral hygiene control.	Incorrect	68 (21.7)	61 (19.4)	**185 (58.9)**
5. Anticoagulant use should be discontinued during dental treatment.	Correct	**229 (72.9)**	26 (8.3)	59 (18.8)
6. Antibiotic prophylaxis should be administered before dental treatments.	Incorrect	96 (30.6)	9 (2.9)	**209 (66.9)**
7. Bleeding problems may occur during dental treatment.	Correct	**276 (87.9)**	9 (2.9)	29 (9.2)
8. These individuals have a high risk of infectious diseases.	Correct	**274 (87.3)**	18 (5.7)	22 (7.0)

Table 3. Distribution of responses by participants' educational status and statistical analysis (p<0.05*).

Questions	**Educational Status**	**Participant Responses (n)**			***p-value***
		Correct	***Don't know***	***Incorrect***	
1. There is no harm in performing dental treatment on dialysis days.	General dentist	25	19	149	0.26
	Dental specialist	8	1	30	
	Dental student	7	9	66	
2. Local anesthetics without adrenaline should be used.	General dentist	110	21	62	0.16
	Dental specialist	20	2	17	
	Dental student	53	3	26	
3. Diazepam can be used for premedication.	General dentist	63	60	70	**0.03***
	Dental specialist	5	19	15	
	Dental student	30	31	21	
4. Alcohol-based mouth rinses should be used for oral hygiene control.	General dentist	45	41	107	0.25
	Dental specialist	9	9	21	
	Dental student	14	11	57	
5. Anticoagulant use should be discontinued during dental treatment.	General dentist	134	19	40	0.06
	Dental specialist	29	0	40	
	Dental student	66	7	9	
6. Antibiotic prophylaxis should be administered before dental treatments.	General dentist	73	8	112	**0.00***
	Dental specialist	12	0	27	
	Dental student	11	1	70	
7. Bleeding problems may occur during dental treatment.	General dentist	173	4	16	0.07
	Dental specialist	30	1	8	
	Dental student	73	4	5	
8. These individuals have a high risk of	General dentist	175	9	9	**0.02***

infectious diseases.	Dental specialist	35	0	4	
	Dental student	64	9	9	

Only 31.2% of participants correctly identified diazepam as a premedication option for hemodialysis patients undergoing dental treatment. Final-year dental students demonstrated a significantly higher knowledge level regarding premedication compared to other groups (p=0.03). The AHA does not recommend antibiotic prophylaxis for non-invasive dental treatments in hemodialysis patients, but it states that the possibility of prophylaxis should be evaluated based on the type of procedure if there are cardiac comorbidities.[17] In our study, 66.9% of participants correctly recognized that prophylaxis is not required before all dental treatments. Final-year dental students demonstrated significantly higher knowledge on this topic compared to other participants (p=0.00).

DISCUSSION

Various oral complications associated with chronic kidney disease (CKD) and hemodialysis have been documented in the literature. The most common manifestations include uremic stomatitis, petechiae, ecchymoses in the oral mucosa, xerostomia, and an increased risk of infections.[3–5,18] With rising global life expectancy, the prevalence of CKD and renal failure-more common among older individuals-has also increased.[19] Hemodialysis is a long-term treatment, typically performed once or more per week. Increased session frequency elevates stress levels, negatively impacting patients' quality of life.[2,9] Long-term hemodialysis patients often experience oral health issues, which have been shown to significantly impact disease-related mortality and morbidity rates.[3,4,20] However, no official guidelines have been established by any institution or organization for the dental treatment of hemodialysis patients. Infective endocarditis, identified as a complication of hemodialysis since the 1960s, poses a significant risk. Studies indicate that hemodialysis patients have a 17% higher likelihood of developing infective endocarditis compared to the general population.[9] The American Heart Association (AHA) guidelines include recommendations for infective endocarditis prophylaxis during the dental treatment of hemodialysis patients.[15-17] The AHA states that there is no sufficient scientific evidence to link microorganisms from dental procedures to infections in peripheral vascular grafts and patches used in hemodialysis. Consequently, it does not recommend antibiotic prophylaxis for hemodialysis patients.[17] Similarly, the European Heart Academy's 2015 guidelines did not recommend antibiotic prophylaxis before invasive dental procedures for CKD patients undergoing hemodialysis.[21] However, the AHA's 2021 guidelines advise prophylaxis for hemodialysis patients with cardiac comorbidities, including heart valve prostheses, previous infective endocarditis, cyanotic congenital heart disease, congenital heart defects repaired with prosthetic materials, and heart transplants.[17] In our study, 33.5% of participants answered incorrectly the question on antibiotic prophylaxis. Similarly, a previous study found that 85% of dentists administered prophylaxis before simple tooth extractions, while 43% did so even for non-invasive dental procedures.[22] This suggests that a significant number of dentists prescribe prophylaxis without a clear indication, potentially increasing the risks of microbial resistance, unnecessary costs, and anaphylactic reactions.[23]

Another critical consideration in hemodialysis patients is anticoagulant use. Heparin is administered parenterally to prevent clotting during blood circulation through the dialysis machine. As heparin remains in circulation for approximately 4–6 hours after administration, scheduling dental treatments at least one day after dialysis is essential. It is recommended to assess INR levels before invasive procedures, and if the INR exceeds 2.5, consultation with a nephrologist should be sought. In emergency dental treatments, the use of a heparin antagonist, such as protamine sulfate, is advised to manage bleeding.[2-4] Local hemostatic measures, such as cold compression and sutures, should be applied after any bleeding procedure in hemodialysis patients. In our study, most participants correctly answered questions related to the timing of dental treatments, bleeding risks, and anticoagulant use, demonstrating awareness of bleeding complications—one of the most critical concerns during invasive procedures in hemodialysis patients. Additionally, due to frequent blood transfusions, hemodialysis patients are at a high risk of hepatitis B and C infections.[7–8] Participants also demonstrated a high level of awareness regarding the risk of infectious diseases (HBV, HCV, HIV) in this population.

Local anesthetics like lidocaine are considered non-nephrotoxic due to their hepatic elimination.[2] Additionally, the high prevalence of hypertension in hemodialysis patients makes adrenaline-free local anesthetics a safer option.[8–9,24] In our study, 58.3% of participants correctly answered the question regarding local anesthetic use. The question with the lowest correct response rate (31.2%) in our study concerned the use of diazepam for premedication in hemodialysis patients. Anxiety and fear during invasive dental procedures can increase the risk of complications in these patients.[9] In such cases, the intraoral administration of diazepam (0.1–0.8 mg/kg) before the procedure has been reported to be beneficial for enhancing patient comfort.[25]

Xerostomia, a common complication in CKD, is linked to hyposalivation in hemodialysis patients and is often accompanied by symptoms such as a tongue coating and taste alterations.[26] To prevent oral infections associated with xerostomia, alcohol-free mouthwashes are recommended alongside oral hygiene measures.[7–9,26] In our study, 58.9% of participants correctly answered the question regarding the use of alcohol-free mouthwash in hemodialysis patients.

In a recent study conducted in Brazil, 51.4% of dentists reported experiencing anxiety during tooth extractions in renal transplant patients.[22] Another study assessing endodontists' knowledge of dental treatment for CKD patients found that most participants had the knowledge and experience necessary to provide appropriate and safe dental care.[27] In our study, participants demonstrated sufficient knowledge about infection, infectious diseases, bleeding risks, and the appropriate timing of dental treatments. However, their awareness of diazepam premedication and the use of alcohol-free mouthwash were comparatively lower. Similarly, knowledge regarding the use of local anesthetics without adrenaline was relatively low. This may be attributed to differences in participant profiles, limited engagement with current literature among general practitioners, and the lack of a guideline regarding dental treatment for hemodialysis patients.

A 2016 study investigating the dental treatment protocols of North American dental schools for CKD patients highlighted the absence of a standardized treatment approach.[10] Notably, none of the participating institutions had their own established treatment protocol.[10] Similarly, Howell et al.[11] reported that 34% of dental schools in the United States followed their own protocols for treating CKD patients, while 65% adhered to the AHA guidelines. The increasing number of patients undergoing hemodialysis due to CKD necessitates that dentists acquire and continuously update their knowledge on the dental treatment of these patients and potential complications. For this purpose, guidelines developed by professional organizations will ensure the implementation of reliable, evidence-based, and standardized protocols in the dental treatment of hemodialysis patients.

CONCLUSION

Our findings highlight the need for dentists to update their knowledge on the dental treatment of hemodialysis patients with CKD. Undergraduate curricula and continuing education programs should incorporate updated guidelines, expand CKD-related content, and encourage general dentists to participate in relevant training programs periodically.

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