

# The Dental Health Status of Dialysis Patients

• Judith T. Klassen, BSc, MD, FRCPC •  
• Brenda M. Krasko, DMD •

## A b s t r a c t

**Background:** The number of patients with kidney failure who require dialysis is growing by 10% to 15% annually, and the likelihood that dentists will treat such patients is also increasing. The dental care of patients undergoing dialysis can be complex, given the prevalence of comorbid conditions such as diabetes, hypertension, renal osteodystrophy and immunosuppression, the presence of nondental prosthetic devices, and the use of antihypertensives and anticoagulants or antiplatelet agents. These patients appear to be predisposed to a variety of dental problems such as periodontal disease, narrowing of the pulp chamber, enamel abnormalities, premature tooth loss and xerostomia. Dental care, as well as primary preventive measures, seems to have been neglected in these patients. Therefore, a study of the dental health of dialysis patients was undertaken.

**Method:** Completion of a questionnaire and a noninvasive oral examination was obtained from hemodialysis and peritoneal dialysis patients registered in the dialysis program at St. Paul's Hospital in Saskatoon, Saskatchewan, as of March 1, 1999. Information was also gathered from the medical chart. Medication history as well as history of diabetes, hypertension, and nondental prosthetic devices were also recorded.

**Results:** Of 226 dialysis patients in central and northern Saskatchewan, 147 were interviewed and examined. Of these, 94 (64%) were dentate, and the same number had been on dialysis for a mean of more than 2 years; about a third were diabetic, almost all were hypertensive and all had nondental prosthetic devices or arteriovenous fistulae, or both. Sixty (64%) of the dentate patients were candidates for kidney transplantation. Most of the dentate patients reported brushing once or more daily, but they flossed infrequently or never. Dental visits were infrequent, less than every 5 years in 59 (63%) of the dentate patients. Findings in the dentate group included increased tooth mobility, fractures, erosion, attrition, recession, gingivitis and a high plaque index. A patient's dentist was contacted if the patient had seen him or her since starting dialysis (31 of the 94 dentate patients). Most (81%) of the dentists were aware that they were treating a dialysis patient. Medication records were incomplete for 29% of the patients, and only 2 (6%) of the patients had received antibiotic prophylaxis despite the fact that all had prosthetic devices or arteriovenous fistulae.

**Clinical Significance:** We conclude that the dental health of dialysis patients is poor and requires greater attention.

**MeSH Key Words:** dental care for chronically ill; kidney diseases/therapy; renal dialysis/adverse effects

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Primary preventive measures for patients undergoing dialysis for kidney failure have previously been overshadowed by concerns about more urgent health problems. In the last 3 to 4 decades, improvements in dialysis and transplantation have reduced morbidity and mortality among patients with end-stage renal disease. As survival improves, more attention must be focused on other areas such as cancer screening and management of coronary artery disease. Dental health appears to be yet another area where attention has been lacking.

The incidence of a variety of dental conditions, such as periodontal disease, narrowing of the pulp chamber,

enamel abnormalities, premature tooth loss and xerostomia, seems greater among dialysis patients.<sup>1-5</sup> These problems may be related to a variety of factors, such as a relative state of immunosuppression, medications, renal osteodystrophy and bone loss, and restriction of oral fluid intake.

Promoting good dental hygiene reduces the risk of oral infections that may predispose a patient to septicemia, endocarditis and possible endarteritis of the vascular access or line for hemodialysis or of catheters for peritoneal dialysis. For a variety of reasons, malnutrition may be a significant problem for dialysis patients, and this condition can be exacerbated by ill-fitting oral prosthetic devices,

carious or missing teeth, and local infections. Ensuring healthy dentition becomes increasingly important when a patient is a candidate for renal transplantation, given the immunosuppressive protocols that may further predispose to oral and possibly disseminated infection.

An observational study was undertaken to determine the dental health status of hemodialysis and peritoneal dialysis patients in central and northern Saskatchewan.

## Methods

Approval for this study was obtained from the Ethics Committee at St. Paul's Hospital, Saskatoon, Saskatchewan. Informed consent for completion of a questionnaire and a noninvasive oral examination was obtained from hemodialysis and peritoneal dialysis patients registered in a dialysis program at the hospital as of March 1, 1999. Excluded were those refusing consent, patients under the age of 16 years, those undergoing dialysis in satellite units and not attending the home clinic, and those who underwent transplantation or died before the end of the study period. The study was conducted between March 1 and May 31, 1999. A questionnaire regarding patient characteristics was administered by a nephrologist (J.T.K.) and a final-year dental student (B.M.K.). Information gathered from the medical chart included the patient's age, duration of dialysis, dialysis modality and candidacy for renal transplantation. Medication history, including the use of acetylsalicylic acid, nonsteroidal antiinflammatory drugs, warfarin, antihypertensives and immunosuppressives, was recorded. History of diabetes, hypertension and prosthetic devices (heart valves, grafts, fistulae, hemodialysis lines or joints) were recorded.

Each participant underwent an intraoral exam, performed by the final-year dental student, who used a mouth mirror and light at the bedside while the patient attended the hemodialysis or home dialysis clinic. Recorded were the numbers of remaining natural teeth, restorations and carious lesions, mobility, enamel defects, fractures, erosions, attrition, recession, gingivitis and soft-tissue lesions. Plaque was visually estimated by means of a disclosing solution. Information was recorded on a modified World Health Organization Oral Health Assessment Form (1986). Probing of periodontal pockets was not done, as antibiotic prophylaxis was not used. Radiography was not performed.

Consent to contact the patient's dentist was obtained if the patient had been seen since initiation of dialysis. Each dentist was questioned by telephone regarding awareness of the fact that his or her patient was undergoing dialysis, charted medications and use of antibiotic prophylaxis.

Statistical analysis included calculation of means and standard deviations.

**Table 1 Demographic characteristics of 147 patients undergoing dialysis in Saskatoon, Saskatchewan**

Characteristic	No. (and %) of patients <sup>a</sup>	
	Dentate	Edentulous
No. of patients	94 (64)	53 (36)
Mean age $\pm$ SD (years)	51.1 $\pm$ 18.8	68.2 $\pm$ 11.8
<b>Sex</b>		
Males	59 (63)	21 (40)
Females	35 (37)	32 (60)
<b>Dialysis modality</b>		
Hemodialysis	69 (73)	48 (91)
Peritoneal dialysis	25 (27)	5 (9)
<b>Dialysis access</b>		
Arteriovenous graft	36 (38)	17 (32)
Arteriovenous fistula	9 (10)	8 (15)
Hemodialysis line	16 (17)	8 (15)
Peritoneal dialysis catheter	13 (14)	9 (17)
More than one of the above	20 (21)	11 (21)
Mean dialysis duration $\pm$ SD (months) <sup>b</sup>	25.1 $\pm$ 29.5	23.8 $\pm$ 25.4
<b>Other medical conditions</b>		
Diabetes	31 (33)	30 (57)
Hypertension	88 (94)	45 (85)
Prosthetic devices	9 (10)	4 (8)
Septicemia or peritonitis	27 (29)	14 (26)
<b>Race</b>		
White	71 (76)	37 (70)
Aboriginal	19 (20)	13 (24)
Oriental	4 (4)	3 (6)
<b>Education</b>		
None	13 (14)	10 (19)
To grade 8	37 (39)	30 (57)
High school	17 (18)	5 (9)
Postsecondary	27 (29)	8 (15)
<b>Method of payment</b>		
Self	45 (48)	9 (17)
Department of Indian Affairs and Northern Development	15 (16)	4 (8)
Social services	14 (15)	9 (17)
Private insurance	20 (21)	31 (58)
<b>Medication</b>		
Antihypertensives	74 (79)	35 (66)
Acetylsalicylic acid	15 (16)	7 (13)
Warfarin	12 (13)	7 (13)
Prednisone	19 (20)	5 (9)
Immunosuppressives	5 (5)	2 (4)
Nonsteroidal antiinflammatory drugs	3 (3)	2 (4)
Transplant candidate	60 (64)	9 (17)

<sup>a</sup>Except where indicated otherwise. For the number of patients in each group (row 1), percentages are calculated on the basis of the total number of patients (147). For all other characteristics, percentages are calculated on the basis of the number of patients in either the dentate or the edentulous group. <sup>b</sup>Does not represent all time on dialysis for those returning after failed transplant.

## Results

A total of 226 patients were registered with the St. Paul's Hospital in-centre, satellite and home dialysis programs at the beginning of the study, in March 1999. Of these patients, 147 participated in the study. Ten refused consent, 46 were not in attendance at the in-centre clinic, 7 were under 16 years of age, and 16 died or received a kidney transplant before the end of the study.

The results of the study are summarized in **Tables 1** through 7.

## Discussion

Previous studies have suggested that the oral hygiene of hemodialysis patients is worse than that of the general population. In a 2-year follow-up study, Locsey and others<sup>1</sup> reported greater calculus formation, gingivitis, caries, atrophy of the alveolar bone, pathologic mobility proportional to bone resorption and tooth loss, pocket formation and necrotic teeth found under crowns, bridges and fillings. In an American study of 45 hemodialysis patients, all had some form of periodontal disease and oral debris, 64% had severe gingivitis and a higher-than-normal score for the decayed, missing and filled index, and 28% had early periodontitis regardless of the duration of dialysis.<sup>2</sup>

Our data have shown that the dental care of dialysis patients in central and northern Saskatchewan is also neglected. These patients reported brushing and flossing infrequently (**Table 2**). Despite the fact that for more than half, costs were paid by private insurance or a government

agency (**Table 1**), most dentate patients visited their dentists infrequently (**Table 2**). Most dialysis patients have complex medical conditions, including hypertension and diabetes, of which their dentists need to be aware. Many take medications that increase the risk of complications during dental visits and that may alter the means of delivery of some services. For example, if a patient is hypertensive, local anesthetic with reduced epinephrine can be used. Anticoagulants and possibly antiplatelet agents may need to be withheld, depending on the dental procedure being contemplated. Immunosuppressed patients may need special care as well.

The dental findings in this study were consistent with significant attrition, recession, gingivitis and accumulation of plaque. The high frequency of attrition may be related to aging or xerostomia. Another possibility is that patients whose fluid intake is restricted may chew ice or suck hard candies to quench their thirst. Aggressive brushing may result in recession but, given that these patients appeared to brush infrequently, recession was more likely due to poor oral hygiene. Recession could only be graded as present or absent, as the examiner was often unable to clearly visualize buccal tooth surfaces because of extensive deposition of plaque and debris.

Similarly, the amount of plaque may have been due to poor oral hygiene. A higher plaque index in dialysis patients than in control patients has been reported previously.<sup>6</sup> In that study correlation between plaque index and periodontal disease was poor. The authors theorized that this finding

**Table 2** Dental hygiene and frequency of dental examination

	No. (and %) of patients	
	Dentate (n = 94)	Edentulous (n = 53)
<b>Brushing frequency</b>		N/A
Once or more daily	74 (79)	
Less than once daily	13 (14)	
Never	7 (7)	
<b>Flossing frequency</b>		N/A
Once daily	5 (5)	
More than once weekly but not daily	20 (21)	
Never	69 (73)	
Use of alcohol-based mouthwash	48 (51)	
<b>Date of last dental visit</b>		
<1 year ago	35 (37)	26 (49)
1-2 years ago	19 (20)	
2-5 years ago	7 (7)	
>5 years ago	33 (35)	
<b>Frequency of dental visits</b>		
More than once annually	14 (15)	
Every 1-2 years	17 (18)	
Every 2-5 years	4 (4)	
Greater than 5-year intervals	59 (63)	

**Table 3** Oral problems (all patients)

	No. (and %) of patients	
	Dentate (n = 94)	Edentulous (n = 53)
Bleeding	17 (18)	2 (4)
Pain	23 (24)	5 (9)
Swelling	10 (11)	4 (8)
Lesions	6 (6)	6 (11)
Dryness	53 (56)	43 (81)

**Table 4** Dental findings (dentate patients only)

Finding	Total (mean/patient)
Total teeth	1982 (21.1)
Sound teeth	743 (7.9)
Decayed teeth	20 (0.2)
Decayed and filled teeth	1 (<0.1)
Filled teeth	534 (5.7)
Crowns	100 (1.1)
Mobile teeth	141 (1.5)
Enamel defects	6 (<0.1)
Fractured teeth	66 (0.7)
Eroded teeth	95 (1.0)
Attrition	537 (5.7)

**Table 5 Oral lesions (all patients)**

Lesion	No. (and %) of patients
Nodules (including hard, soft, verrucous and pigmented)	21 (14)
Angular cheilitis	6 (4)
Trauma	14 (10)
Macules	6 (4)
Ulcerations	6 (4)
White patches (including candidiasis, leukoplakia and lichen planus)	16 (11)
Rhomboid glossitis	2 (1)
Erythematous patches	18 (12)

**Table 6 Recession, gingivitis and plaque index (dentate patients only)**

	No. (and %) of patients
<b>Recession</b>	
≥ 5 surfaces	49 (52)
< 5 surfaces	44 (47)
N/A <sup>a</sup>	1 (1)
<b>Gingivitis</b>	<b>93 (99)</b>
<b>Plaque index</b>	
≥ 50%	72 (77)
< 50%	4 (4)
Refused disclosing solution	18 (19)

<sup>a</sup>Crowns placed to gingival margin.

was related to the immune-modulating effect of chronic renal failure. No significant difference between the hemodialysis group and the matched controls with regard to the periodontal index score and pocket depth was noted. However, others have found accelerated periodontal disease in patients with renal failure, possibly related to impaired white cell function.<sup>7,8</sup> Almost all of the patients in this study had gingivitis (Table 6).

Erosion of lingual tooth surfaces was more common than expected in our patients. Contributors to this problem might include uremic and medication-induced vomiting or the use of hard candies as a salivary stimulant. In addition, we suspected bulimia in several patients with dietary indiscretions, who might purge certain restricted foods.

The number of decayed teeth was probably underestimated in our study, as probing and radiography were not performed. However, a low rate of caries observed in another study was thought to be related to a possible antibacterial effect of urea or increased calculus.<sup>9</sup> Again, the amount of plaque and debris precluded visualization of the complete tooth structure in many of the patients examined in this study.

Tooth mobility was likely secondary, at least in part, to renal osteodystrophy. This bone disease, commonly seen in patients with renal failure, results from secondary hyperparathyroidism. Structural bone changes in the mandible radiate from the lamina dura of the anterior teeth to the

**Table 7 Responses of 31 dentists contacted about their dialysis patients**

Question	No. (and %) of dentists
Dentist aware that patient was on dialysis	25 (81)
Antibiotic prophylaxis given during last visit	2 (6)
Correlation with and accuracy of patient-reported frequency of visits (within 3 months)	27 (87)
Medication list in dental office up to date	22 (71) <sup>a</sup>

<sup>a</sup>Excludes one record for which medication list was illegible.

surrounding bone and inferiorly and superiorly. Spongy bone is less mineralized, and there is loss of the lamina dura.<sup>7</sup>

Narrowing of the pulp chamber is common in patients with renal failure.<sup>1,4,10</sup> This observation may be incidental, or the chamber narrowing may lead to pulp exposure, if the thicker, softer predentin layer is not handled with extra care when teeth are prepared for restoration.

Xerostomia is related to the overall volume status of patients who are discouraged from drinking excess fluid. Possibly contributing to the dryness is the use of mouthwashes containing alcohol. Dysgeusia and uremic fetor, bad taste and odour are caused not only by xerostomia but also by the presence of urease-splitting oral organisms, which metabolize urea (present in high levels in these patients) and thus elaborate ammonia.

Of the dentists contacted, most were aware that their patients were undergoing dialysis, and for most of the patients the medication list was complete (Table 7). There was good correlation between patients' and dentists' records of visits. However, 39 (41%) of dentate dialysis patients reported not having seen a dentist within the past 2 years, and 32 (34%) had not seen a dentist in more than 5 years (Table 2).

Antibiotic prophylaxis was seldom administered (Table 7), despite the fact that all patients had an arteriovenous graft, a fistula, a hemodialysis line or a peritoneal dialysis catheter. Although the American Heart Association recommends administration of prophylactic antibiotics to patients with prosthetic devices undergoing a variety of dental procedures, there is no consensus among nephrologists about this practice.<sup>11</sup> Dental practitioners should check with the patient's nephrologist to see if antibiotic prophylaxis is indicated.

A significant number of the patients were candidates for kidney transplantation and should have received meticulous pretransplant dental care. However, such was not the case. This lack of care may put these patients at higher risk of local or disseminated infection relating to dentition once they are taking immunosuppressive medication.

Our study was limited by the environment in which it was performed. For patient convenience, all exams were

done at the bedside with simple instruments. Lack of probing and radiography limited our ability to detect caries. The patients received no advance warning of the study; therefore, the amount of plaque was overestimated, as more of the patients would probably have brushed their teeth before their dialysis appointment if they had known about the oral examination.

### Recommendations and Conclusions

1. Record the patient's medical history and medication list on the dental chart and review these documents at each visit.
2. The dialysis unit should notify the dentist once dialysis has been initiated.
3. Perform dental treatment of hemodialysis patients on non-dialysis days to ensure absence of circulating heparin.
4. Use local anesthetics with reduced epinephrine in all dialysis patients, as most are hypertensive.
5. Withhold anticoagulants for a period of time agreed upon with the nephrologist.
6. Be aware that meticulous local hemostatic measures, including mechanical pressure, packing, suturing and topical thrombin, may be required, given the platelet dysfunction that often occurs in patients with renal failure.
7. Avoid compression of the arm with the arteriovenous graft or fistula. Never use this arm for blood pressure measurements, intravenous administration of medication or phlebotomy.
8. Lidocaine, narcotics (except meperidine) and diazepam can be used safely in patients with renal failure. Dose adjustment is needed for aminoglycosides and cephalosporins. Tetracycline is generally not recommended in patients with end-stage renal failure. Many nephrologists agree to the use of nonsteroidal anti-inflammatory drugs, as dialysis patients usually have little salvageable renal function.
9. See the patient for dental check-ups as regularly as would be the case if they were not undergoing dialysis.
10. For patients being considered for transplantation, complete all necessary dental care before the surgery.
11. Use antibiotic prophylaxis, if recommended by the patient's nephrologist, before extractions, periodontal procedures, placement of dental implants, reimplantation of avulsed teeth, endodontic instrumentation or surgery (beyond the apex only), subgingival placement of antibiotic fibres or strips, initial placement of orthodontic bands and intraligamentary injections of local anesthetic. Advise the patient about the need for the

antibiotic, such that it can be prescribed and taken just before the dental visit.

12. Advise patients to avoid chewing on ice; instead, recommend that they suck on the ice or chew sugar-free gum.
13. Recommend that alcohol-free mouthwashes be used to reduce oral dryness. Alternatively, recommend a saliva substitute.
14. Follow universal precautions. The importance of doing so should not be underestimated, as the incidence of hepatitis B and C may be higher among dialysis patients.

Awareness must be raised among dialysis patients, their nephrologists and their dentists about the need for primary dental prevention. Dentists will probably see more dialysis patients in the future, given the 10% to 15% annual growth in the incidence of end-stage renal disease. All parties must be knowledgeable about the treatment priorities, operative concerns and precautions to be taken in this special population. ♦

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*Dr. Klassen is medical director of dialysis, St. Paul's Hospital, Saskatoon, Saskatchewan.*

*Dr. Krasko is a community dentist in Regina, Saskatoon.*

*Correspondence to: Dr. J.T. Klassen, Division of Nephrology, St. Paul's Hospital, 1702 20th Street West, Saskatoon, SK S7M 0Z9. E-mail: klassenju@sdh.sk.ca.*

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