

Observational Study

Factors associated with regular dental visits among hemodialysis patients

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Abstract

AIM

To investigate awareness and attitudes about preventive dental visits among dialysis patients; to clarify the

barriers to visiting the dentist.

METHODS

Subjects included 141 dentate outpatients receiving hemodialysis treatment at two facilities, one with a dental department and the other without a dental department. We used a structured questionnaire to interview participants about their awareness of oral health management issues for dialysis patients, perceived oral symptoms and attitudes about dental visits. Bivariate analysis using the χ^2 test was conducted to determine associations between study variables and regular dental check-ups. Binominal logistic regression analysis was used to determine factors associated with regular dental check-ups.

RESULTS

There were no significant differences in patient demographics between the two participating facilities, including attitudes about dental visits. Therefore, we included all patients in the following analyses. Few patients (4.3%) had been referred to a dentist by a medical doctor or nurse. Although 80.9% of subjects had a primary dentist, only 34.0% of subjects received regular dental check-ups. The most common reasons cited for not seeking dental care were that visits are burdensome and a lack of perceived need. Patients with gum swelling or bleeding were much more likely to be in the group of those not receiving routine dental check-ups (χ^2 test, $P < 0.01$). Logistic regression analysis demonstrated that receiving dental check-ups was associated with awareness that oral health management is more important for dialysis patients than for others and with having a primary dentist ($P < 0.05$).

CONCLUSION

Dialysis patients should be educated about the importance of preventive dental care. Medical providers are expected to participate in promoting dental visits among dialysis patients.

Key words: Hemodialysis; Questionnaire; Oral health; Dental visit; Health management

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Core tip: We investigated dialysis patients' awareness and attitudes about preventive dental visits, and tried to clarify the barriers to visiting the dentist. Subjects included 141 dentate outpatients receiving hemodialysis treatment. We interviewed participants using a structured questionnaire. The common reasons dialysis patients cited for not seeking dental care were lack of concern and/or lack of awareness of the importance of preventive dental visits. Medical practitioners rarely refer dialysis patients for dental care. Our findings suggest that dialysis patients should be educated about the importance of preventive dental care. Medical providers are expected to participate in promoting dental visits among dialysis patients.

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INTRODUCTION

As of December 31, 2013, there were 314180 dialysis patients in Japan, a number that has been increasing yearly^[1]. Most dialysis facilities do not have dental departments^[2]. Prior to this study, we hypothesized that inconvenient accessibility could be a barrier to dental visits among dialysis patients. Dialysis patients have a high risk of dental caries and periodontitis^[3,4]. Recently, several studies have reported a significant association between moderate to severe periodontitis and mortality among hemodialysis patients^[5-7]. Therefore, preventive dental care should be considered very important for this population.

In this study, we tried to determine factors associated with regular dental visits and to determine barriers to preventive dental care among hemodialysis patients, to promote improvement in holistic oral health management.

MATERIALS AND METHODS

Outpatients receiving hemodialysis treatment at two dialysis facilities, one with a dental department (Facility A) and the other without (Facility B), were included in this study. The total number of patients receiving hemodialysis at Facility A was approximately 600; approximately 150 received hemodialysis at Facility B. The inclusion criteria for this study were outpatients receiving hemodialysis treatment three times per week, and who agreed to participate in the study. Because we needed to interview patients at their bedsides, we excluded patients who had difficulty conversing independently. We used a structured questionnaire to interview 141 dentate patients about their awareness of oral health management issues, their perceived oral symptoms and their attitudes about seeking dental care (Figure 1). Written informed consent for participation was not obtained from the participants in this study; we regarded replying to the interview questions as signifying agreement to participate, as we explained in the document that was provided to each patient at the start of the interview.

Statistical analyses were performed with the SPSS 17.00 statistical package (SPSS Japan Inc., Tokyo, Japan). Bivariate analysis using the χ^2 test was conducted to determine associations between study variables and regular dental check-ups. Binominal logistic regression analysis was used to determine factors associated with regular dental check-ups. Statistical significance was accepted at a level of 0.05

Questionnaire

Age sex (male/female)

How long have you been receiving dialysis treatment? Years months

Are you employed? (yes/no)

Is there a dental department at the facility where you receive dialysis treatment? (Yes/No/Not sure)

Have you ever been referred to a dentist by a medical practitioner? (Yes/No)

Do you think that oral health management is more important for patients receiving dialysis treatment than for others? (Yes/No) If "Yes," why do you think so?

How many teeth do you have? [Most (≥ 20) / half (10-19) / few (< 10) / zero]

Do you have dentures? (Yes/no/unused)

Do you have any oral symptoms? (1) toothache/sensitivity; (2) loose tooth; (3) gum swelling/bleeding; (4) food impaction; (5) bad breath; (6) sticky mouth; (7) crooked teeth; (8) malocclusion; (9) clicking of the jaw; (10) missing tooth; (11) dry mouth; (12) rough lips; (13) abnormal taste; (14) frequent stomatitis; (15) odd feeling to dentures; (16) other

Do you have a primary dentist? (Yes/no)

Do you receive a dental check-up once a year or more? (Yes/no)

When did you last visit a dentist? Years, months ago

When do you visit the dentist? (1) I visit regularly, even without a specific problem. (2) I visit irregularly, when I have a specific problem. (3) I occasionally do not visit the dentist, even if problems are present. (4) I never visit the dentist.

If you answered, "I do not receive dental check-ups," why? (1) no perceived need; (2) it is burdensome; (3) lack of time; (4) anxiety about dental treatment; (5) physical barrier (fatigue); (6) psychological barrier (fear/pain/hate); (7) economic burden; (8) lack of accessibility; (9) no attendant; (10) no reliable dentist; (11) other

Please suggest ideas that would make it easier for dialysis patients to receive dental check-ups.

Figure 1 Questionnaire.

and lower.

RESULTS

Distribution of participants

The distribution of respondents is shown in Table 1. The age of the respondents ranged from 29 to 86 years, with a mean age of 63.1 years (SD 11.0). The mean duration of dialysis was 10.3 years (SD 8.7); 42.6% had been receiving dialysis for more than 10 years. The percentage of employed patients was 34.8%.

There were no significant differences in patient demographics between the two participating facilities, including attitudes about dental visits. Therefore, we included all patients in the following analyses.

Awareness of oral health management issues

Only 4.3% of subjects had been referred to a dentist by their medical practitioner. Twenty-three percent of the respondents considered oral health management to be important for dialysis patients; most of these were aware of the association between periodontitis and general health conditions.

Self-reported oral health status

Self-reported oral health conditions are shown in Table 2. Oral health problems reported by dialysis patients included dry mouth (39.0%), bad breath (34.8%) and gum swelling/bleeding (20.6%).

Factors associated with dental visits

Eighty percent of subjects had a primary dentist, but only 34% of participants received regular dental check-ups. However, 66.0% of subjects had visited a dentist in the past year, suggesting that a considerable number of oral problems had arisen. As for the timing of dental visits,

56.0% of subjects answered that they visited a dental office only when symptoms arose; 5.7% answered that they sometimes refused to visit a dentist even if oral symptoms were present. The reasons cited for not seeking a dental check-up are shown in Table 3. The most common reasons given were "it is burdensome" and "no perceived need", followed by "lack of time" and "psychological barrier (fear/pain/hate)". As shown in Table 4, χ^2 testing demonstrated that receiving regular dental check-ups was significantly associated with awareness of oral health management issues related to dialysis and with having a primary dentist ($P < 0.01$). The prevalence of self-reported gum swelling/bleeding was higher among those not receiving dental check-ups than among those receiving dental check-ups ($P < 0.01$). Binominal logistic regression analysis using "receiving dental check-ups" as the outcome variable demonstrated that receiving dental check-ups was significantly associated with awareness of oral health management issues related to dialysis treatment, having many teeth, having dentures and having a primary dentist (Table 5).

DISCUSSION

Because the interviewer in this study was from a third party, not from a dialysis facility or a private dental clinic, and because personal information was completely anonymized, we believe that we were able to elicit patients' opinions and thoughts without bias. Barriers to visiting the dentist included a lack of awareness of the need for care, cost and fear of dental procedures^[8,9]. Especially among patients with special health care needs, dental fear and/or anxiety is considered the most common barrier to accessing oral health care^[10]. Prior to this study, we had hypothesized that time restrictions or general fatigue would be the main reasons that dialysis

Table 1 Demographic profiles of participants

Facility	Facility A With dental department	Facility B Without dental department	Total
Number of subjects	88	53	141
Age	61.9 ± 11.6	65.1 ± 9.7	63.1 ± 11.0
Sex			
Male	59	31	90
Female	29	22	51
Duration of dialysis			
< 1 yr	6	4	10
1-4 yr	23	12	35
5-9 yr	21	15	36
≥ 10 yr	38	22	60
Employment			
Employed	35	15	50
Unemployed	53	38	91
Primary dentist			
Yes	68	46	114
No	20	7	27
Dental check-up			
Yes	31	17	48
No	57	36	93

Table 2 Self-reported oral health status (n = 141)

	No.	% of Subjects
Number of teeth		
≥ 20	101	71.6
10-19	25	17.7
1-9	15	10.6
Possession of denture		
Yes	34	24.1
No/unused	107	75.9
Oral symptom		
Toothache/sensitive	26	18.4
Shaking tooth	22	15.6
Gum swelling/bleeding	29	20.6
Food impaction	104	73.8
Bad breath	49	34.8
Sticky mouth	30	21.3
Crooked teeth	21	14.9
Malocclusion	28	19.9
Clicking of jaw joint	14	9.9
Lack of tooth	13	9.2
Dry mouth	55	39.0
Rough lip	22	15.6
Wrong taste	15	10.6
Frequent stomatitis	20	14.2
Odd feeling to denture	2	1.4
Other	8	5.7

patients do not seek dental care. As shown in Table 3, some patients answered “no time to go” as a reason for not seeking dental care. However, we found that lack of concern and/or lack of awareness of the need for preventive dental visits were common reasons in this population. In Japan, most dental care is covered by medical insurance. In fact, dialysis patients are sometimes provided with additional insurance benefits. Therefore, nobody answered “economic burden” as a reason for not seeking dental care.

Table 3 Reasons for not seeking dental care (n = 93)

	No.	% of subjects
No perceived need	33	23.4
Burdensome	36	25.5
No time to go	16	11.3
Anxiety for dental treatment	2	1.4
Physical burden (fatigue/tired)	3	2.1
Psychological burden (fear/painful/hate)	13	9.2
Economic burden	0	0.0
Uneasy accessibility	0	0.0
No attendant	2	1.4
No reliable dentist	0	0.0
Others	10	7.1

Recently, the close relationship between periodontal disease and systemic disease has been highlighted^[11,12]. It has been reported that severe periodontitis can affect mortality in hemodialysis patients^[5-7]. Studies involving patients with chronic kidney disease found that efficient initial periodontal therapy lowered serum levels of some inflammatory biomarkers^[13,14].

Our results showed that awareness of the oral health management issues of dialysis patients led to preventive dental visits in this population. Therefore, providing dialysis patients with information about the relationship between periodontitis and systemic conditions might effectively promote preventive oral health care.

Dialysis patients tend to be at high risk for tooth decay and periodontal disease^[15]. Oral surgical procedures require extra precautions in these patients because of associated medications (e.g., anticoagulants) and complications (e.g., hypertension, diabetes). Therefore, dialysis patients must be informed of their greater need for preventive dental care compared with the general population.

Medical history and/or drug use can impact oral health; however, we did not investigate those parameters and therefore cannot draw conclusions on that subject. However, we found that patients with gum swelling or bleeding were much more likely to be in the group of those not receiving routine dental check-ups. This finding suggests that gingival inflammation caused by other illnesses and/or drug use might not lead to routine dental visits.

The percentage of subjects receiving regular dental checkups was 34.0% in this study. According to the National Health and Nutrition Survey of 2012, 47.8% of adults and 55.3% of individuals in their sixties had received a dental check-up in the past year^[16]. A survey in 2010 in Tokushima, the same prefecture in which the present study was carried out, reported those percentages to be 43.6% and 51.0%, respectively^[17]. Therefore, the percentage of dialysis patients who sought dental checkups in this study was lower than that of the general population.

In a previous study, we showed that most hemodialysis outpatients in Japan received dialysis treatment at a facility without a dental department^[2]. The present

Table 4 Distribution of subjects receiving *vs* not receiving dental checkups, according to study variable (χ^2 test)

Variable	Receive dental check-up		Not receive dental check-up		P
	n ¹	% ²	n ¹	% ²	
Sex					
Male	29	60.4	61	65.6	0.545
Female	19	39.6	32	34.4	
Employment					
Employed	15	31.3	34	36.6	0.502
Unemployed	33	68.8	59	63.4	
Referral to dental visit by medical practitioner					
Yes	4	8.3	2	2.2	0.102
No	44	91.7	91	97.8	
Possession of denture					
Yes	17	35.4	17	18.3	0.024
No/unused	31	64.6	66	71.0	
Gum swelling/bleeding					
Yes	4	8.3	25	26.9	0.007
No	44	91.7	68	73.1	
Consciousness of oral health management because of dialysis treatment					
Yes	18	37.5	15	16.1	0.005
No	30	62.5	78	83.9	
Having a primary dentist					
Yes	46	95.8	68	73.1	0.001
No	2	4.2	25	26.9	

¹n: Total number of subjects corresponding to each answer; ²%. The percentage of subjects who answered “receive a dental check-up” or “not receive a dental check-up”.

Table 5 Factors associated with receiving dental check-ups, according to binominal logistic regression analysis¹ (n = 141)

Variable	OR	95%CI	P-value
Consciousness of oral health management because of dialysis treatment	3.241	1.298-8.125	0.012
Number of teeth	2.361	1.060-5.258	0.035
Possession of denture	4.209	1.271-13.933	0.019
Having a primary dentist	6.138	1.279-29.456	0.023
Gum swelling/bleeding	5.831	1.659-20.499	0.006

¹Binominal logistic regression analysis was conducted using each of five variables as the dependent variable.

study included dialysis patients at facilities with and without dental departments. We found no difference between the facilities in the percentage of patients receiving dental check-ups. Few patients at either facility had been referred for a dental visit by their medical practitioner. Education on the importance of regular dental care is necessary for dialysis patients. Moreover, medical providers are expected to participate in promoting dental visits among dialysis patients.

In conclusion, recognition that oral health management is more important for dialysis patients than for the general population might increase regular dental visits in this population. We found that patients who received dental check-ups had fewer symptoms of gum swelling or bleeding, suggesting that periodic dental visits could be effective in preventing an inflammatory response.

Medical providers should participate in promoting dental visits among dialysis patients.

COMMENTS

Background

In Japan, a number of dialysis patients have been increasing yearly. Since dialysis patients have a high risk of dental caries and periodontitis, preventive dental care should be considered very important for this population. In this study, they tried to determine factors associated with dental visits and to determine barriers to preventive dental care among hemodialysis patients.

Research frontiers

Recently, several studies have reported that severe periodontitis can affect mortality in hemodialysis patients. Studies involving patients with chronic kidney disease (CKD) found that efficient initial periodontal therapy lowered serum levels of some inflammatory biomarkers in CKD patients. Therefore, oral health management towards dialysis patients gets attention. The research hotspot is to elucidate the factors associated with dental visits among hemodialysis patients in order to resolve the barriers for dental visits.

Innovations and breakthroughs

Recently, the close relationship between periodontal disease and systemic disease has been highlighted. Many studies describe the oral health conditions of hemodialysis patients. However, there are very few English language literatures sources concerning preventive dental visit among dialysis patients. The present study elucidated the barriers to visiting the dentist, which the authors must manage with first in order to promote a preventive dental care among dialysis patients.

Applications

The data in this study suggested that awareness of oral health management issues should be strengthened among not only dialysis patients but also medical providers. Furthermore, this study suggested that periodic dental visits could be effective in preventing an inflammatory response.

Terminology

“Preventive dental visits” means that patients visit dental clinic periodically without a specific problem. The purpose of preventive dental visit is often oral examination and professional mechanical tooth cleaning to maintain the favorable oral health condition. “Primary dentist” should offer preventive dental care to their patients in Japan, however, many patients only visit their primary dentist when they have a specific problem in their mouth.

Peer-review

Factors associated with regular dental visits among hemodialysis patients is an absorbing manuscript; the research design is well established and fulfills all the requirements for a clinical study. Besides, the conclusion emphasizes the importance of a multidisciplinary approach to hemodialysis patients attain healthy oral conditions.

REFERENCES

- 1 Statistical Surveys conducted by Japanese Society for Dialysis Therapy. Report on 15 the number of maintenance hemodialysis patients. [accessed 2016 Feb 17]. Available from: URL: <http://docs.jsdt.or.jp/overview/pdf2014/p003.pdf>
- 2 **Yoshioka M**, Shirayama Y, Imoto I, Hinode D, Yanagisawa S, Takeuchi Y. Current status of collaborative relationships between dialysis facilities and dental facilities in Japan: results of a nationwide survey. *BMC Nephrol* 2015; **16**: 17 [PMID: 25880326 DOI: 10.1186/s12882-015-0001-0]
- 3 **Klassen JT**, Krasko BM. The dental health status of dialysis patients. *J Can Dent Assoc* 2002; **68**: 34-38 [PMID: 11844416]
- 4 **Swapna LA**, Reddy RS, Ramesh T, Reddy RL, Vijayalaxmi N, Karmakar P, Pradeep K. Oral health status in haemodialysis patients. *J Clin Diagn Res* 2013; **7**: 2047-2050 [PMID: 24179940 DOI: 10.7860/JCDR/2013/5813.3402]
- 5 **de Souza CM**, Braosi AP, Luczyszyn SM, Olandoski M, Kotanko P, Craig RG, Trevilatto PC, Pecoits-Filho R. Association among oral health parameters, periodontitis, and its treatment and mortality in patients undergoing hemodialysis. *J Periodontol* 2014; **85**: e169-e178 [PMID: 24224959 DOI: 10.1902/jop.2013.130427]
- 6 **Chen LP**, Chiang CK, Peng YS, Hsu SP, Lin CY, Lai CF, Hung KY. Relationship between periodontal disease and mortality in patients treated with maintenance hemodialysis. *Am J Kidney Dis* 2011; **57**: 276-282 [PMID: 21177012 DOI: 10.1053/j.ajkd.2010.09.016]
- 7 **Kshirsagar AV**, Craig RG, Moss KL, Beck JD, Offenbacher S, Kotanko P, Klemmer PJ, Yoshino M, Levin NW, Yip JK, Almas K,

- Lupovici EM, Usvyat LA, Falk RJ. Periodontal disease adversely affects the survival of patients with end-stage renal disease. *Kidney Int* 2009; **75**: 746-751 [PMID: 19165177 DOI: 10.1038/ki.2008.660]
- 8 **Kengne Talla P**, Gagnon MP, Dramaix M, Leveque A. Barriers to dental visits in Belgium: a secondary analysis of the 2004 National Health Interview Survey. *J Public Health Dent* 2013; **73**: 32-40 [PMID: 23215822 DOI: 10.1111/jphd.12003]
- 9 **Saddki N**, Yusoff A, Hwang YL. Factors associated with dental visit and barriers to utilisation of oral health care services in a sample of antenatal mothers in Hospital Universiti Sains Malaysia. *BMC Public Health* 2010; **10**: 75 [PMID: 20163741 DOI: 10.1186/1471-2458-10-75]
- 10 **Gordon SM**, Dionne RA, Snyder J. Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Spec Care Dentist* 1998; **18**: 88-92 [PMID: 9680917 DOI: 10.1111/j.1754-4505.1998.tb00910]
- 11 **Kuo LC**, Polson AM, Kang T. Associations between periodontal diseases and systemic diseases: a review of the inter-relationships and interactions with diabetes, respiratory diseases, cardiovascular diseases and osteoporosis. *Public Health* 2008; **122**: 417-433 [PMID: 18028967 DOI: 10.1016/j.puhe.2007.07.004]
- 12 **Otomo-Corgel J**, Pucher JJ, Rethman MP, Reynolds MA. State of the science: chronic periodontitis and systemic health. *J Evid Based Dent Pract* 2012; **12**: 20-28 [PMID: 23040337 DOI: 10.1016/S1532-3382(12)70006-4]
- 13 **Artese HP**, Sousa CO, Luiz RR, Sansone C, Torres MC. Effect of non-surgical periodontal treatment on chronic kidney disease patients. *Braz Oral Res* 2010; **24**: 449-454 [PMID: 21180967 DOI: 10.1590/S1806-83242010000400013]
- 14 **Yazdi FK**, Karimi N, Rasouli M, Roozbeh J. Effect of nonsurgical periodontal treatment on C-reactive protein levels in maintenance hemodialysis patients. *Ren Fail* 2013; **35**: 711-717 [PMID: 23534529 DOI: 10.3109/0886022X.2013.777890]
- 15 **Borawski J**, Wilczyńska-Borawska M, Stokowska W, Myśliwiec M. The periodontal status of pre-dialysis chronic kidney disease and maintenance dialysis patients. *Nephrol Dial Transplant* 2007; **22**: 457-464 [PMID: 17124280 DOI: 10.1093/ndt/gfl676]
- 16 **Ministry of Health, Labour and Welfare**. The National Health and Nutrition Survey in Japan 2012. [accessed 2016 Feb 17]. Available from: URL: <http://www.mhlw.go.jp/bunya/kenkou/eiyou/h24houkoku.html>
- 17 **The Tokushima Prefectural Government**. The current status of health and nutrition among residents in Tokushima Prefecture. 2010

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