Factors associated with regular dental visits among hemodialysis patients

Masami Yoshioka, Yasuhiko Shirayama, Issei Imoto, Daisuke Hinode, Shizuko Yanagisawa, Yuko Takeuchi, Takashi Bando, Narushi Yokota

Masami Yoshioka, Shizuko Yanagisawa, Department of Oral Health Science and Social Welfare, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima 7708504, Japan

Yasuhiko Shirayama, Yuko Takeuchi, Department of Community Medicine and Welfare, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima 7708504, Japan

Issei Imoto, Department of Human Genetics, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima 7708503, Japan

Daisuke Hinode, Department of Hygiene and Oral Health Science, Institute of Biomedical Sciences, Tokushima University Graduate School, Tokushima 7708504, Japan

Takashi Bando, Department of Oral Surgery, Kawashima Hospital, Tokushima 7700011, Japan

Narushi Yokota, Department of Kidney Disease (Artificial Kidney and Kidney Transplantation), Kawashima Hospital, Tokushima 7700011, Japan

Author contributions: Yoshioka M was the principal investigator and was involved in study conception, design and supervision; Shirayama Y participated in study design; Imoto I participated in study design and critically reviewed the manuscript; Hinode D participated in statistical analysis and critically reviewed the manuscript; Yanagisawa S performed data collection and input; Takeuchi Y performed data collection and input; Bando T and Yokota N arranged the interviews at the dialysis facilities; all authors have given their approval for the final version of the paper to be published.

Supported by A Grant-in-Aid for Scientific Research (25463246) from the Japan Society for the Promotion of Science.

Institutional review board statement: This study was approved by the ethics committee of Tokushima University Hospital (No. 1741).

Informed consent statement: All study participants gave their informed consent verbally prior to study inclusion.

Conflict-of-interest statement: There are no conflicts of interest to report.

Data sharing statement: No additional data are available.

Open-Access: This article is an open-access article which was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: http://creativecommons.org/licenses/by-nc/4.0/

Manuscript source: Invited manuscript

Correspondence to: Masami Yoshioka, DDS, PhD, Associate Professor, Department of Oral Health Science and Social Welfare, Institute of Biomedical Sciences, Tokushima University Graduate School, 3-18-15 Kuramotocho, Tokushima 7708504, Japan. yoshioka.masami@tokushima-u.ac.jp
Telephone: +81-88-6339171
Fax: +81-88-6339171

Received: February 18, 2016
Peer-review started: February 22, 2016
First decision: March 25, 2016
Revised: May 6, 2016
Accepted: June 27, 2016
Article in press: June 29, 2016
Published online: September 6, 2016

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 $\chi^2$ 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 ($\chi^2$ 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

© The Author(s) 2016. Published by Baishideng Publishing Group Inc. All rights reserved.

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.
Yoshioka M et al. Regular dental visits among hemodialysis patients

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, $\chi^2$ 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 ($P < 0.01$). Binomial 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. Especially among patients with special health care needs, dental fear and/or anxiety is considered the most common barrier to accessing oral health care. Prior to this study, we had hypothesized that time restrictions or general fatigue would be the main reasons that dialysis...
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.

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[21]. The present

### 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)

| Oral symptom | No. | % of Subjects |
|---------------|-----|---------------|
| ≥ 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 |
| Toothache / sensitive | | |
| 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 |

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

| Reason for not seeking dental care | 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 |

---

Yoshioka M et al.  Regular dental visits among hemodialysis patients
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.

---

### Table 4  Distribution of subjects receiving or not receiving dental checkups, according to study variable (χ² test)

| Variable                                      | Receive dental check-up | Not receive dental check-up | P |
|-----------------------------------------------|------------------------|-----------------------------|---|
|                                              | n¹ | %¹ | n² | %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 | 81.7 |
| 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 binomial logistic regression analysis (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.

---
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, Vijayalaksmi 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, Trevallo PC, Pecois-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, Usuyat 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, Daraix M, Leveaque 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, Rehman 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/S1522-3382(12)70006-4]
13. Arteze 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 M, Rasouli M, Roobeh 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. Borawska 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