

DOI: 10.5455/msm.2018.30.58-61

Received: November 27 2017; Accepted: January 18, 2018

© 2018 Ali Ghareeb Altamimi, Saud Alnouri AlBakr, Thamer Alaswad Alanazi, Faleh A. Alshahrani, Elna Paul Chalisserry, Sukumaran Anil

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

CASE STUDY

Mater Sociomed. 2018 Mar; 30(1): 58-61

# Prevalence of Periodontitis in Patients Undergoing Hemodialysis: a Case Control Study

Ali Ghareeb Altamimi<sup>1</sup>, Saud Alnouri AlBakr<sup>1</sup>, Thamer Alaswad Alanazi<sup>1</sup>, Faleh A. Alshahrani<sup>2</sup>, Elna Paul Chalisserry<sup>3</sup>, Sukumaran Anil<sup>4</sup>

<sup>1</sup>Department of Dentistry, Ministry of Health Hospitals, Riyadh, Saudi Arabia

<sup>2</sup>Department of Oral and Maxillofacial Surgery, King Fahad Medical City, Riyadh, Saudi Arabia

<sup>3</sup>Department of Maxillofacial Surgery and Diagnostic Sciences, College of Dentistry, Jazan University, Jazan, Saudi Arabia

<sup>4</sup>Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha University, Poonamallee High Road, Chennai, India

**Corresponding author:** Dr. Sukumaran Anil, BDS, MDS, PhD, FDS RCS (Edin), FDS RCPS(Glas). Department of Periodontics, Saveetha Dental College and Hospitals, Saveetha University, Poonamallee High Road, Chennai 600077, India. ORCID ID: <http://orcid.org/0000-0002-6440-8780> Phone: +919496749734. Fax: +914712310245. E-mail: [drsamil@gmail.com](mailto:drsamil@gmail.com).

## ABSTRACT

**Objectives:** To assess the prevalence of periodontal disease among patients undergoing renal dialysis. **Methods:** Sixty hemodialysis patients (30 males, 30 females) with a mean age of 44.4±9.5 years comprised the study group. Periodontal parameters such as plaque index (PI), bleeding on probing (BOP), probing pocket depth (PPD) and clinical attachment level (CAL) were measured in these patients and 60 age and sex-matched control subjects. The data was tabulated and analyzed. **Results:** The mean duration of dialysis was 5.50±3.02 years. The plaque index (PI) bleeding on probing (BOP), Periodontal probing depth (PPD) and clinical attachment level (CAL) were significantly higher in patients undergoing hemodialysis than in control subjects. The mean clinical attachment level was significantly higher among the dialysis patients (2.78±0.83 mm) than the control subjects (1.97±0.53 mm). The plaque index and bleeding on probing also showed a similar pattern in patients undergoing hemodialysis compared to control patients. The prevalence and severity of periodontal disease seems to be higher in patients undergoing dialysis. **Conclusion:** From the observations of this study, it can be concluded that patients undergoing hemodialysis are more prone to periodontal diseases. Further studies with a larger population and a comparison with the duration of dialysis may further substantiate the current findings.

**Keywords:** Renal Dialysis, Periodontal Diseases, Oral Hygiene, Periodontal Pocket, Dental Plaque Index, Gingival Recession.

## 1. INTRODUCTION

The kidneys play an essential role in the maintenance of hemostasis by their capacity to remove

metabolic waste products, electrolytes and water from the body. Chronic renal failure (CRF) is the result of the progressive and chronic deterioration of nephrons, which makes it necessary to employ extra-renal blood-filtering techniques, mainly hemodialysis (1). The role of the kidneys in human metabolic homeostasis is exemplified by the fact that renal failure has been shown to result in anemia, hypertension, neuropathy, thyroid dysfunction and reduced libido (2). Chronic renal failure (CRF) is defined as a progressive decline in the renal function associated with a reduced glomerular filtration rate (GFR).

Hemodialysis (HD) is an artificial means of removing nitrogenous waste and other toxic products of metabolism from blood. It saves lives and increases the quality of life in patients with irreversible, severe renal impairment due to glomerulonephritis, interstitial nephritis, unresolved acute tubular necrosis, renal toxicity from exposure to chemicals or drugs, obstructive uropathy, nephrolithiasis and systemic diseases causing end stage renal disease (3). Patients receiving hemodialysis are more susceptible to mortality and morbidity from infections because of their general debilitation, depressed immunologic responses and masking of the signs and symptoms of infection as a side effect of their drug therapy, which can lead to delayed diagnosis and treatment (4).

Oral manifestations that have been reported include mucosal lesions, oral infections, dental anomalies and bone lesions due to secondary hyperparathyroidism, gingivitis, mucosal pallor and lesions, an altered microbiological environment, tooth mobility, malocclusion and an increased risk for dental erosion (5). Oral health maintenance is essential for HD patients waiting for a renal transplant since oral pathologies or infections could jeopardize the success of the

transplantation (6). Conflicting data have been reported in the literature on the effect of long term dialysis therapy on oral health status (7, 8).

Periodontal disease is a chronic inflammatory condition leading to the formation of infected periodontal pockets, the destruction of the deep collagenous structures of the periodontium and alveolar bone, the excessive mobility of the teeth and their premature loss (9). Periodontitis destroys the supporting tissues of the teeth, induces local inflammation, and is associated with a systemic inflammatory response (10-12). Severe periodontal conditions have been observed in hemodialysis patients; however, no significant relations have been noted with the duration of dialysis (13). Studies have shown an association between high levels of C-reactive protein and interleukin-6 in periodontitis (14, 15). Hence, because of an association with the systemic inflammatory response, periodontitis has recently been included as a nontraditional risk factor for chronic kidney disease (CKD)(16). An increased prevalence and/or severity of periodontitis have been reported in patients undergoing hemodialysis (8, 13, 17). The predisposing and aggravating factors for periodontal disease such as hyposalivation and xerostomia, impaired immunity and wound healing, alveolar bone destruction due to renal osteodystrophy and malnutrition are widespread in patients with chronic renal failure (18, 19). Only a few studies are available on the prevalence of periodontitis in hemodialysis patients (20-23). Hence, the present study was undertaken to evaluate the prevalence and severity of periodontitis among patients undergoing hemodialysis. The observations were compared with a control group.

## 2. MATERIALS AND METHODS

A cross-sectional study was conducted in 60 patients undergoing dialysis. The study was approved by the Institutional Review Board of the College of Dentistry Research Center, King Saud University, Riyadh. This study was conducted on two groups: patients with chronic renal failure receiving HD and healthy control subjects (C). The HD group consisted of 60 patients currently receiving hemodialysis therapy at King Khalid University Hospital, Riyadh. Sixty age-matched control subjects were included from the hospital population. The distribution of HD and C subjects in the study is shown in Table 1.

The participant age, gender, dialysis duration and consumed drugs (drug name, daily dosage and time of consumption), as well as any existing systemic disease, were recorded. The patients with systemic conditions other than dialysis affecting periodontium status, such as diabetes mellitus, were excluded from the study. All the subjects in the HD group had been treated with hemodialysis for at least 3 months.

### Clinical Periodontal Examination

The medical history of each patient was recorded using a written questionnaire and an interview lasting 20 to 30 min. For each patient, a complete examination and recording of the intraoral clinical parameters were performed. One clinical examiner performed all the clinical measurements. Calibration exercises for probing measurements were performed in five patients before the actual study. Intra-examiner agreement was good, with a k value of 0.82. Periodontal probing depth (PPD), clinical attachment level (CAL), plaque index

(PI) and bleeding on probing (BOP) were measured using the Williams periodontal probe at the mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual and disto-lingual surfaces of each tooth.

The plaque score percentage was calculated after applying a disclosing agent (Displaque®, Pace-maker Corporation, Oregon, USA) by the method of O'Leary et al (24). After rinsing the oral cavity, the mesial, distal, buccal and lingual surface were examined for the staining. The presence of plaque was indicated by the dye. Those surfaces that did not have soft accumulations of plaque at the dentogingival junction were not recorded. After all teeth were examined and scored, the PI was calculated by dividing the number of plaque containing surfaces by the total number of available surfaces.

### Data Analysis

Statistical analysis of the data was performed using GraphPad InStat® software (GraphPad Software, San Diego, California, USA; [www.graphpad.com](http://www.graphpad.com)). Mean and standard deviation scores were calculated for age, plaque index (PI), bleeding on probing (BOP), periodontal probing depth (PPD) and clinical attachment level (CAL). Comparisons were made between the groups using the paired t-test.

## 3. RESULTS

The demographic status of the healthy and dialysis patients is given in Table 1. The mean age was 44.4±9.5 years for the dialysis patients and 43.8±9.6 years for the control subjects. No statistically significant difference was observed in the age of the patients. The duration of dialysis varied from 2 to 10 years with a mean of 5.3±2.7 years. The mean and standard deviation of the plaque index percentage, the bleeding on probing percentage, the probing pocket depth and the clinical attachment level loss are shown in Table 2 and Figure 1. All periodontal parameters were significantly higher in patients undergoing dialysis than in the age-matched control subjects. The mean clinical attachment level was found to be significantly higher among the dialysis patients (2.78±0.83 mm) than in the control subjects (1.97±0.53 mm). The plaque index and bleeding on probing also showed significantly higher values in patients undergoing dialysis compared to the control group.

	Hemodialysis Pts (Mean ± SD)		Control (Mean ± SD)	
	Male	Female	Male	Female
Number of Subjects	30	30	30	30
Age (in years)	44.0±9.6	44.7±9.5	43.8±9.6	43.7±9.9
Duration of Dialysis (years)	5.2±2.8	5.4±2.7	NA	NA

Table 1. Demographic characteristics of the study population

Parameters (n=60)	Hemodialysis Patients (Mean ± SD)	Control (Mean ± SD)	P Value
PI (%)	80.1±18.25	55.48±16.69	0.0021
BOP (%)	66.55±26.59	35.38±16.94	0.0007
PPD (mm)	5.08±0.87	3.97±0.53	0.3608
CAL (mm)	2.78±0.83	1.97±0.53	0.0009

PI: Plaque index, BOP: Bleeding on probing, PPD: Probing pocket depth, CAL: Clinical attachment level

Table 2. Periodontal parameters in hemodialysis patients and controls

#### 4. DISCUSSION

Periodontal disease is a common, initially bacteria-driven, chronic inflammatory condition leading to the formation of infected periodontal pockets, the destruction of the deep collagenous structures of the periodontium and alveolar bone, the excessive mobility of the teeth and their premature loss (25). The susceptibility to periodontal disease depends on factors such as host response, pathogenic flora, age, gender, education and the frequency of dental visits. Several studies have been published in the literature providing evidence for an increased prevalence of periodontal disease in patients with renal disease, especially in dialysis patients and renal transplant recipients (8, 26, 27).

End-stage renal disease has been shown to affect not only the general health of the patient but also the oral and periodontal health (28). The observations from this study revealed that patients on HD had severe periodontal problems compared to control patients. 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 (3, 8, 16, 28).

This increase in plaque and calculus deposition in the HD patients could be attributed to poor oral hygiene maintenance (29). This may be related to their negligence as well as compliance after dental treatment (30). In the periodontally compromised patients, inflammatory cytokines are secreted in response to the lipopolysaccharides of periodontitis pathogens, causing renal disorders or making the disease more severe. Thus, some have suggested periodontal assessments to determine the risk of renal diseases (16). Systemic and salivary changes due to chronic renal failure, the use of multiple medications, vomiting and reduced oral self-care could all potentially affect oral health in these patients (31). The uremic state in the hemodialysis patients may suppress inflammatory reactions in the tissues, which would result in the infrequent detection of gingival inflammation (32). In contrast, another investigation found no correlation between uremia and gingival inflammation in chronic renal failure patients (33). In the present study, we found that the gingival inflammation and subsequent destruction of periodontal tissues were greater in HD patients than in control subjects. Although patients receiving hemodialysis have a certain degree of immunosuppression, they can still achieve a similar response to the periodontal pathogens of existing bacterial plaque as their systemically healthy counterparts (10). The limitations of the present study are that only one center was included and that the sample size was relatively small, but comparable, to most previous reports (17, 31).

#### 5. CONCLUSIONS

Based on the observations of this cross-sectional study, it can be concluded that patients on hemodialysis are prone to periodontitis. This reiterates the need to carry out dental

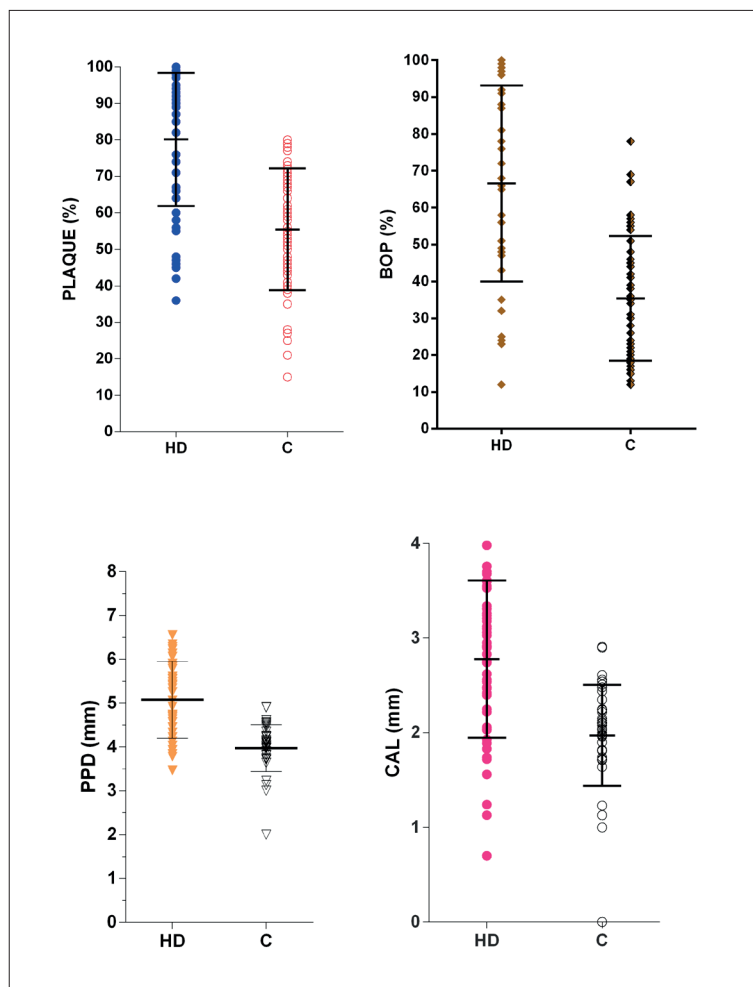


Figure 1. Showing the PI: Plaque index, BOP: Bleeding on probing, PPD: Probing pocket depth, CAL: Clinical attachment level in patients undergoing dialysis and control subjects (HD-Hemodialysis, C-Control group)

treatment ahead of dialysis to control and prevent periodontal infection that could jeopardize the outcome. The importance of maintaining meticulous oral hygiene during dialysis is emphasized.

• **Conflict of Interest:** none declared.

• **Authors contributions:** AGA, SAA, TAA, FAA, EPC, SA were involved in the design of the study. AGA, SAA and TAA did the examination and recorded the data. FAA, EPC and SA analyzed the data and wrote the manuscript. All authors revised and approved the manuscript before submission.

#### REFERENCES

1. Stenvinkel P, Alvestrand A. Inflammation in end-stage renal disease: sources, consequences, and therapy. *Semin Dial.* 2002; 15(5): 329-37.
2. Stenvinkel P, Heimbürger O, Lindholm B, Kaysen GA, Bergström J. Are there two types of malnutrition in chronic renal failure? Evidence for relationships between malnutrition, inflammation and atherosclerosis (MIA syndrome). *Nephrol Dial Transplant.* 2000; 15(7): 953-60.
3. Scannapieco FA, Panesar M. Periodontitis and chronic kidney disease. *J Periodontol.* 2008; 79(9): 1617-9.
4. Craig RG. Interactions between chronic renal disease and periodontal disease. *Oral Dis.* 2008; 14(1): 1-7.
5. Proctor R, Kumar N, Stein A, Moles D, Porter S. Oral and dental

- aspects of chronic renal failure. *J Dent Res.* 2005; 84(3): 199-208.
6. Svirsky JA, Nunley J, Dent CD, Yeatts D. Dental and medical considerations of patients with renal disease. *J Calif Dent Assoc.* 1998; 26(10): 761-70.
  7. Ferguson CA, Whyman RA. Dental management of people with renal disease and renal transplants. *N Z Dent J.* 1998; 94(417): 125-30.
  8. Gavalda C, Bagan J, Scully C, Silvestre F, Milian M, Jimenez Y. Renal hemodialysis patients: oral, salivary, dental and periodontal findings in 105 adult cases. *Oral Dis.* 1999; 5(4): 299-302.
  9. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. *Lancet.* 2005; 366(9499): 1809-20.
  10. Kshirsagar AV, Offenbacher S, Moss KL, Barros SP, Beck JD. Antibodies to periodontal organisms are associated with decreased kidney function. The Dental Atherosclerosis Risk In Communities study. *Blood Purif.* 2007; 25(1): 125-32.
  11. D'Aiuto F, Ready D, Tonetti MS. Periodontal disease and C-reactive protein-associated cardiovascular risk. *J Periodontol Res.* 2004; 39(4): 236-41.
  12. Ide M, McPartlin D, Coward PY, Crook M, Lumb P, Wilson RF. Effect of treatment of chronic periodontitis on levels of serum markers of acute-phase inflammatory and vascular responses. *J Clin Periodontol.* 2003; 30(4): 334-40.
  13. Al-Wahadni A, Al-Omari MA. Dental diseases in a Jordanian population on renal dialysis. *Quintessence Int.* 2003; 34(5): 343-7.
  14. Craig RG, Kotanko P, Kamer AR, Levin NW. Periodontal diseases - a modifiable source of systemic inflammation for the end-stage renal disease patient on haemodialysis therapy? *Nephrol Dial Transplant.* 2007; 22(2): 312-5.
  15. Marcaccini AM, Meschiari CA, Sorgi CA, Saraiva MC, de Souza AM, Faccioli LH, et al. Circulating interleukin-6 and high-sensitivity C-reactive protein decrease after periodontal therapy in otherwise healthy subjects. *J Periodontol.* 2009; 80(4): 594-602.
  16. Fisher MA, Taylor GW. A prediction model for chronic kidney disease includes periodontal disease. *J Periodontol.* 2009; 80(1): 16-23.
  17. Naugle K, Darby ML, Bauman DB, Lineberger LT, Powers R. The oral health status of individuals on renal dialysis. *Ann Periodontol.* 1998; 3(1): 197-205.
  18. Charra B, Chazot C. Volume control, blood pressure and cardiovascular function. Lessons from hemodialysis treatment. *Nephron Physiol.* 2003; 93(4): p94-101.
  19. Chuang SF, Sung JM, Kuo SC, Huang JJ, Lee SY. Oral and dental manifestations in diabetic and nondiabetic uremic patients receiving hemodialysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2005; 99(6): 689-95.
  20. Zhao D, Zhang S, Chen X, Liu W, Sun N, Guo Y, et al. Evaluation of periodontitis and bone loss in patients undergoing hemodialysis. *J Periodontol.* 2014; 85(11): 1515-20.
  21. de Souza CM, Braosi AP, Luczynszyn SM, Olandoski M, Kotanko P, Craig RG, et al. Association among oral health parameters, periodontitis, and its treatment and mortality in patients undergoing hemodialysis. *J Periodontol.* 2014; 85(6): e169-78.
  22. Craig RG, Kotanko P. Periodontitis and the end-stage renal disease patient receiving hemodialysis maintenance therapy. *Compend Contin Educ Dent.* 2009; 30(8): 544: 46-52.
  23. Kadiroglu AK, Kadiroglu ET, Sit D, Dag A, Yilmaz ME. Periodontitis is an important and occult source of inflammation in hemodialysis patients. *Blood Purif.* 2006; 24(4): 400-4.
  24. O'Leary TJ, Drake RB, Naylor JE. The plaque control record. *J Periodontol.* 1972; 43(1): 38.
  25. Spahr A, Klein E, Khuseyinova N, Boeckh C, Muche R, Kunze M, et al. Periodontal infections and coronary heart disease: role of periodontal bacteria and importance of total pathogen burden in the Coronary Event and Periodontal Disease (CORODONT) study. *Arch Intern Med.* 2006; 166(5): 554-9.
  26. Kardachi BJ, Newcomb GM. A clinical study of gingival inflammation in renal transplant recipients taking immunosuppressive drugs. *J Periodontol.* 1978; 49(6): 307-9.
  27. Bayraktar G, Kurtulus I, Duraduryan A, Cintan S, Kazancioglu R, Yildiz A, et al. Dental and periodontal findings in hemodialysis patients. *Oral Dis.* 2007; 13(4): 393-7.
  28. Nylund K, Meurman JH, Heikkinen AM, Honkanen E, Vesterinen M, Ruokonen H. Oral health in predialysis patients with emphasis on periodontal disease. *Quintessence Int.* 2015; 46(10): 899-907.
  29. Epstein SR, Mandel I, Scopp IW. Salivary composition and calculus formation in patients undergoing hemodialysis. *J Periodontol.* 1980; 51(6): 336-8.
  30. Galili D, Kaufman E, Leviner E, Lowental U. The attitude of chronic hemodialysis patients toward dental treatment. *Oral Surg Oral Med Oral Pathol.* 1983; 56(6): 602-4.
  31. Bots CP, Brand HS, Poorterman JH, van Amerongen BM, Valentijn-Benz M, Veerman EC, et al. Oral and salivary changes in patients with end stage renal disease (ESRD): a two year follow-up study. *Br Dent J.* 2007; 202(2): E3.
  32. Savica V, Santoro D, Mazzaglia G, Ciolino F, Monardo P, Calvani M, et al. L-carnitine infusions may suppress serum C-reactive protein and improve nutritional status in maintenance hemodialysis patients. *J Ren Nutr.* 2005; 15(2): 225-30.
  33. Kitsou VK, Konstantinidis A, Siamopoulos KC. Chronic renal failure and periodontal disease. *Ren Fail.* 2000; 22(3): 307-18.