

# Dental and Periodontal Findings in Hemodialysis Patients

Mudhfar Mohammed Meizel, Nawres Bahaa Mohammed<sup>1</sup>

Department of Medicine, College of Medicine, University of Al-Qadisiyah, Al-Diwaniyah Province, Iraq, <sup>1</sup>Maxillofacial Department, College of Dentistry, University of Al-Ameed, Karbala, Iraq

## Abstract

**Background:** End-stage renal disease (ESRD) are more to infections due to their decrease in immune systems and general debilitated health, most of patients with renal failure showing oral symptoms. **Objectives:** The aim of this study is to assessment the kind and severity of oral symptoms in ESRD patients undergoing hemodialysis and compare these results with healthy, disease-free persons. **Materials and Methods:** The study involved 40 individuals, comprising 20 hemodialysis patients and 20 healthy control. The patient group was randomly chosen from ESRD patients, while the control group consisted of disease-free persons with normal glomerular filtration rates. The symptoms such as dry mouth, taste changes, halitosis, and mucosal pain, and were oral changes like tongue coating, pallor, ulceration, and enamel hypoplasia. **Results:** The ESRD patients established significantly more oral changes compared to the control group. These due to metabolic disorders caused by renal failure. **Conclusion:** there is significant impact of ESRD on the oral health of the patients, with correlation between oral health and ESRD.

**Keywords:** Dental, findings, hemodialysis, patients, periodontal

## INTRODUCTION

Chronic renal failure (CRF) refers to the progressive, irreversible deterioration of kidney function, which typically evolves over several years due to the reduction in functional nephrons.<sup>[1]</sup> This condition is marked by a prolonged low glomerular filtration rate that lasts for three months or more. The prevalence of CRF is reportedly on the rise globally.<sup>[2]</sup> When the kidneys are not functioning properly, it can lead to diverse signs and symptoms across all body systems. Notably, approximately 90% of individuals with renal failure present with oral symptoms. These could potentially be outcomes of dialysis, renal transplantation, or the underlying causes of CRF itself.<sup>[3,4]</sup> Patients with CRF are more prone to infections due to their weakened overall health and compromised immune responses.<sup>[4-6]</sup> Both oral diseases and dental procedures can cause bacteremia, the presence of bacteria in the bloodstream, which could lead to serious health complications and even death, particularly in patients undergoing dialysis. Oral conditions such as Gingivitis (which is a common and mild form of gum disease), periodontal disease that causes irritation, redness, and swelling (inflammation) of the gingiva, (the part of the gum around the base of teeth), dental pulp diseases, oral ulcers,

and dental procedures can all result in bacteremia. Therefore, a comprehensive understanding of the oral manifestations in CRF patients is crucial not only for diagnosing the underlying disease but also for taking preventative measures against bacteremia and its potential complications.<sup>[7,8]</sup> The goal of this study is to evaluate the prevalence of periodontal disease and the severity of oral manifestations in patients undergoing renal dialysis and compare these findings with those in a healthy, disease-free control group.

## MATERIALS AND METHODS

This case-control study was conducted at Al-Diwaniyah Teaching Hospital from February 2021 to October 2021. The study aimed to examine oral health, including gingivitis, periodontitis, and dental health, in two groups of patients: Group I comprised 20 hemodialysis patients of different ages and genders, whereas group II consisted

**Address for correspondence:** Dr. Mudhfar Mohammed Meizel, Department of Medicine, College of Medicine, University of Al-Qadisiyah, Al-Diwaniyah Province, Iraq, 12345. E-mail: m.meizel@yahoo.com

**Submission:** 20-May-2023 **Accepted:** 18-Sep-2023 **Published:** 17-Jul-2024

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Meizel MM, Mohammed NB. Dental and periodontal findings in hemodialysis patients. Med J Babylon 2024;21:342-5.

### Access this article online

#### Quick Response Code:



**Website:**  
<https://journals.lww.com/mjby>

**DOI:**  
10.4103/MJBL.MJBL\_592\_23

of 20 systemically healthy individuals seeking dental treatment. The patients' medical and oral histories were taken into account, along with their daily oral health habits. The clinical examination focused on the color, shape, size, consistency, and texture of the gingiva. A periodontal probe was used to determine the severity of any periodontal pockets, and a dental examination looked at the presence and prevalence of decayed teeth, filled teeth, and missing teeth. Patients with diseases such as diabetes, cardiovascular disease, HIV/AIDS, osteoporosis, and sexually transmitted diseases that potentially influence glomerular filtration rate (GFR) and/or oral health status were excluded from the research using predetermined exclusion criteria. We also ruled out patients who were taking any drugs that might compromise their dental health. Oral alterations such as coating on the tongue, pallor, ulceration, red or white lesions, and enamel hypoplasia were seen, and participants were queried regarding symptoms such as dry mouth, changed taste, halitosis, mucosal soreness, bleeding tendencies, and burning feelings. Patients were given thorough care and suggestions after these examinations were conducted, such as demonstrations of the proper way to brush and floss and encouragement to give up any bad habits that might have an adverse effect on their dental health. SPSS 22 was used for statistical analysis, and the mean, median, and standard deviation were calculated for numerical data. Chi-square was employed to analyze the correlation between the variables. When comparing means or medians of continuous data, the *t* test is employed to determine statistical significance. A statistically significant *P* value is less than or equal to 0.05.

### Statistical analysis

Statistical analysis was carried out using Statistical Package for the Social Sciences (SPSS) version 23.0 (SPSS, IBM Company, Chicago, IL 60606, USA) was used for statistical analysis. The mean, median, and standard deviation were calculated for numerical data. Chi-square was employed to analyze the correlation between the variables. When comparing means or medians of continuous data, the *t* test is employed to determine statistical significance. A statistically significant *P* value is less than or equal to 0.05.

### Ethical approval

The study adhered to the Declaration of Helsinki's directives for conducting low-risk research on participants. Before obtaining any samples, we obtained the patient's verbal and analytical consent. Document 110 (containing the number and date January 16, 2021) indicates that the local ethics committee reviewed and approved the research protocol, subject information, and permission form.

## RESULTS

The study included 20 patients with end-stage renal disease (ESRD) and 20 apparently healthy control

**Table 1: Distribution of patients and control subjects according to gender**

| Gender | Control, <i>n</i> = 20 | ESRD, <i>n</i> = 20 | $\chi^2$ | <i>P</i> |
|--------|------------------------|---------------------|----------|----------|
| Male   | 11 (55%)               | 9 (45%)             | 0.400    | 0.527 ¥  |
| Female | 9 (45%)                | 11 (55%)            |          | NS       |

¥: Chi-square test; NS: not significant at *P* ≤ 0.05

**Table 2: Mean age and age range in control and patients group**

| Groups                 | Mean age (years) | SD    | Minimum | Maximum | <i>P</i> † |
|------------------------|------------------|-------|---------|---------|------------|
| Control, <i>n</i> = 20 | 27.80            | 9.98  | 18      | 50      | 0.011      |
| ESRD, <i>n</i> = 20    | 38.25            | 14.32 | 13      | 69      | S          |

†: Independent samples *t* test, SD: standard deviation, S: related mean (significant)

**Table 3: Mean duration of ESRD and hemodialysis in patients group**

| Characteristic           | Mean (years) | SD   | Minimum | Maximum |
|--------------------------|--------------|------|---------|---------|
| Duration of ESRD         | 4.92         | 4.46 | 0.17    | 20      |
| Duration of hemodialysis | 3.24         | 2.43 | 0       | 9       |

SD: standard deviation

**Table 4: Number of percentage of patients with ESRD according to number of hemodialysis session per week**

| Sessions/week | <i>n</i> | %  |
|---------------|----------|----|
| 2             | 10       | 50 |
| 3             | 10       | 50 |

**Table 5: Number of percentage of patients with ESRD according to duration of hemodialysis session**

| Session duration (h) | <i>n</i> | %  |
|----------------------|----------|----|
| 2                    | 2        | 10 |
| 3                    | 15       | 75 |
| 3.5                  | 2        | 10 |
| 4                    | 1        | 5  |

subjects. The distribution of patients and control subjects according to gender is shown in Table 1. There was no significant difference in the distribution of patients and control subjects according to gender (*P* = 0.527); however, the mean age of patients was significantly higher than that of control subjects,  $38.25 \pm 14.32$  years versus  $27.80 \pm 9.98$  years (*P* = 0.011) [Table 2]. The mean duration of ESRD was  $4.92 \pm 4.46$  and it ranged between 0.17 years (2 months) and 20 years; whereas, the mean duration since hemodialysis was  $3.24 \pm 2.43$  and it ranged between several days (0 year) and 9 years, as shown in Table 3. The frequency of hemodialysis sessions per week and the duration of each session in hours are shown in Tables 4 and 5, respectively. There was no significant difference in mean number of missing teeth and mean number of teeth with carries between control and patient groups

**Table 6: Dental health status in patients and control group**

| Characteristic      | Control, <i>n</i> = 20 | ESRD, <i>n</i> = 20 | <i>P</i> <sup>†</sup> |
|---------------------|------------------------|---------------------|-----------------------|
| Missing teeth       | 0.95 ± 1.10            | 1.55 ± 0.89         | 0.065<br>NS           |
| Teeth with caries   | 1.25 ± 0.85            | 1.80 ± 1.58         | 0.178<br>NS           |
| Teeth with fillings | 1.15 ± 1.04            | 0.20 ± 0.52         | 0.001<br>HS           |

<sup>†</sup>: Mann–Whitney's *U* test; *n*: number of cases; NS: not significant at ≤0.05; HS: highly significant at ≤0.05

**Table 7: Comparison of indicators of oral health between control and patients group**

| Characteristic | Control  |      | ESRD     |      | $\chi^2$ | <i>P</i>            |
|----------------|----------|------|----------|------|----------|---------------------|
|                | <i>n</i> | %    | <i>n</i> | %    |          |                     |
| Gingivitis     | 3        | 15.0 | 14       | 70.0 | 12.379   | <0.001 <sup>†</sup> |
| Plaque         | 10       | 50.0 | 18       | 90.0 | 7.619    | 0.006 <sup>‡</sup>  |
| Periodontitis  | 1        | 5.0  | 4        | 20.0 | 0.914    | 0.339 <sup>‡</sup>  |

<sup>†</sup>: Chi-square test,

<sup>‡</sup>: Yates correction for continuity

(*P* > 0.05); however, mean number of teeth with filling was significantly lower in patients with ESRD than in the control group, as shown in Tables 6 and 7, respectively.

## DISCUSSION

This study corroborates the high prevalence of poor oral health among hemodialysis patients.<sup>[9]</sup> Interestingly, we found no significant correlation between the duration of hemodialysis and the severity of periodontitis. While several limited studies have explored the impact of dialysis duration on the development of periodontitis, their conclusions remain contentious. For instance, Schmalz *et al.*<sup>[9]</sup> reported a worsening periodontal condition over time in a group of 68 hemodialysis patients. After a decade on hemodialysis, a significantly pronounced increase was observed. Santos-Paul *et al.*<sup>[10]</sup> found similar results in their study of 253 hemodialysis patients, associating longer dialysis duration with severe periodontitis. Conversely, our findings align with those of Rustemeyer *et al.*<sup>[9]</sup> and Tuma *et al.*<sup>[11]</sup> suggested that the heightened prevalence of periodontal diseases is primarily due to poor oral hygiene rather than chronic uremia. Their study, involving 304 subjects (152 hemodialysis patients and 152 controls), echoed our results. Similarly, Osuh *et al.*<sup>[12]</sup> noted a concerning level of poor oral hygiene among 180 Iranian hemodialysis patients, irrespective of their duration on dialysis. They suggested that these changes likely occur much earlier, during the initial stages of Chronic Kidney Disease (CKD), even before dialysis commences. Given our study's primary aim, we assessed demographic characteristics, dentition status, and periodontal tissue conditions of hemodialysis patients. Our results showed that patients with gingivitis were generally younger and had twice as many teeth compared

to those with periodontitis.<sup>[13]</sup> We found that 24% of the dialysis group had gingivitis and approximately 75% had periodontitis. In contrast, Nemesh *et al.*<sup>[14]</sup> reported a higher proportion (59%) of periodontitis patients with an average pocket depth of 4.79 mm. Moreover, Bao *et al.*<sup>[15]</sup> diagnosed 40% of their hemodialysis patients with moderate periodontitis and 53% with severe periodontitis, requiring periodontal treatment in 57% of cases. Our findings further indicated that older patients who began dialysis had worse oral hygiene, more severe gingival inflammation, and fewer teeth.

## CONCLUSION

This research found that hemodialysis patients had significantly higher rates of periodontal disease, with 70% having gingivitis, 90% having a high plaque index, and 20% having periodontitis. Additional research including a bigger sample size and a comparison of patients' dialysis treatment times could provide more support for the present results.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Sinjari HY, Ibrahim JM. Thyroid function disorders in patients with chronic kidney disease. *Med J Babylon* 2022;19:76-80.
2. Ziebolz D, Fischer P, Hornecker E, Mausberg RF. Oral health of hemodialysis patients: A cross-sectional study at two German dialysis centers. *Hemodial Int* 2012;16:69-75.
3. Selman NA, Albayati AHA, Alsaffar Y, Farhan AH. The risk impact and benefits of Ramadan fasting on patients with type 2 diabetes in a sample of Iraqi patients. *Med J Babylon* 2023;20:352-6.
4. Al-Shibly KH, Al-Diwan JK. Effect of the dietary protein intake on urea reduction rate in patients on maintenance hemodialysis in Merjan Teaching Hospital. *Med J Babylon* 2022;19:244-9.
5. Schmalz G, Wendorff H, Berisha L, Meisel A, Widmer F, Marcinkowski A, *et al.* Association between the time after transplantation and different immunosuppressive medications with dental and periodontal treatment need in patients after solid organ transplantation. *Transpl Infect Dis* 2018;20:e12832.
6. Marti Alamo S, Gavalda Esteve C, Sarrión Pérez MG. Dental considerations for the patient with renal disease. *J Clin Exp Dent* 2011;3:e112-9.
7. Batta S, Preston A, Bicknell L. New arteriovenous skin rash in a patient with ESKD on dialysis. *Kidney360* 2023;4:423-4.
8. Pass B, Mercer J, Majd NM, Glascoe A, Brown RS. Oral radiographic evidence of secondary hyperparathyroidism in an end-stage renal failure patient: A case report. *Northwest Dent* 2017;96:33-7.
9. Schmalz G, Eisner M, Binner C, Wagner J, Rast J, Kottmann T, *et al.* Oral health-related quality of life of patients after heart transplantation and those with heart failure is associated with general health-related quality of life: A cross-sectional study. *Qual Life Res* 2020;29:1621-30.
10. Santos-Paul MA, Neves RS, Gowdak LHW, de Paula FJ, David-Neto E, Bortolotto LA, *et al.* Cardiovascular risk reduction with periodontal treatment in patients on the waiting list for renal transplantation. *Clin Transplant* 2019;33:e13658.

11. Tuma M, Silva Andrade N, Correia Aires R, Cristelli MP, Medina Pestana JO, Gallottini M. Oral findings in kidney transplant children and adolescents. *Int J Paediatr Dent* 2022;32: 894-902.
12. Osuh ME, Oke GA, Lilford RJ, Owoaje E, Harris B, Taiwo OJ, *et al*. Prevalence and determinants of oral health conditions and treatment needs among slum and non-slum urban residents: Evidence from Nigeria. *PLoS Glob Public Health* 2022;2:e0000297.
13. Gasner NS, Schure RS. Periodontal disease. In: StatPearls. Treasure Island, FL: StatPearls Publishing; 2023.
14. Nemesh OM, Honta ZM, Slaba OM, Shyivskyi IV. Pathogenetic mechanisms of comorbidity of systemic diseases and periodontal pathology. *Wiad Lek* 2021;74:1262-7.
15. Bao J, Yang Y, Xia M, Sun W, Chen L. Wnt signaling: An attractive target for periodontitis treatment. *Biomed Pharmacother* 2021;133:110935.