

ORAL HYGIENE AND PERIODONTAL STATUS OF PATIENTS UNDERGOING RENAL DIALYSIS IN QAZVIN – IRAN

¹JALAL HAMISSI, ²J POURSAMIMI, ³M R NASSEH

ABSTRACT

The primary purpose of this investigation was to evaluate the oral health and gingival status of individual's undergoing renal dialysis in Qazvin province.

One hundred eighty Iranian patients on hemodialysis participated in the study, and were divided into three subgroups: 1) those who have been on renal dialysis for less than one year; 2) those on renal dialysis for 1 to 3 years; and 3) those on renal dialysis for longer than 3 years. Four dental indices: the debris index (DI); the calculus index (CI); the plaque index (PI) and the gingival index (GI) were used. Data were compiled and analyzed by using 1-way analysis of variance (ANOVA).

The results of this study showed 100% (n=180) of the individuals undergoing renal dialysis were suffering from mild to moderate gingivitis. The means of debris index was 1.65, 2.07, and 2.15, with $SD \pm 0.67$, 0.47 and 0.48 respectively for the subgroups. The means of plaque index were 1.72, 2.16 and 2.26 with $SD \pm 0.64$, 0.36 and 0.42 respectively for the revealed groups. The means of calculus index were 1.58, 2.02 and 2.09, with $SD \pm 0.58$, 0.28 and 0.39 respectively for the subgroups. The means of gingival index were 1.43, 2.97 and 0.06 with $SD \pm 0.67$, 0.38 and 0.35 for the subgroups respectively. Tukey's post hoc test showed significant difference in all indices between the first and second subgroups, and between the first and third subgroups, while no significant difference was found between second and third subgroups.

It was concluded that periodontal disease was present in renal dialysis patients who showed unacceptable level of oral hygiene and which may increase the illness. Finding led to the conclusion that the renal dialysis population in Qazvin Province, regardless of length of time on dialysis, was in need of comprehensive professional oral care and self-care instructions.

Key words: Hemodialysis, chronic renal failure, dialysis, dental management, periodontitis.

INTRODUCTION

Chronic renal failure is defined as the progressive and usually irreversible decline of the glomerular filtration rate, leading to an increase of serum creatinine and blood ureic nitrogen levels. The most frequent causes of chronic renal failure are hypertension, diabetes mellitus, chronic glomerulonephritis, uropathy and autoimmune diseases.^{1,2,3}

Dialysis is an artificial mean of removing nitrogenous and other toxic products of metabolism from the

blood. For many patients, dialysis is a life-saving intervention that estimated that up to 90% of patients receiving renal dialysis showed oral symptoms.⁴ This might be due to elevated blood urea nitrogen (BUN) and creatinine, and diet restriction.⁵ The most prominent oral sign found in dialysis patients is pallor of the oral mucosa, which reflects anemia, while other signs may include xerostomia, breath with urea odour and an accelerated rate of calculus formation as a result of altered serum calcium- phosphate product.⁶

^{1,2,3} Department of Periodontics and Preventive Dentistry, Faculty of Dentistry, Qazvin University of Medical Science, Qazvin–Iran

Patients receiving dialysis are more susceptible to infections because of general debilitation, depression of the immunologic response and masking of signs and symptoms of infection by drug therapy.^{7,8,9,10} The purpose of the study was to evaluate the periodontal health status of patients on hemodialysis.

The systemic manifestations show alterations in the oral cavity: calculus, high urea concentration in saliva, ammonia-like smell, xerostomia, oral bleeding, stomatitis, pale gingival, drug-induced gingival hyperplasia, loss of lamina dura, maxillary and mandibular radiolucent lesions, abnormal bone remodeling after extraction, enamel hypoplasia, delayed tooth eruption pattern, low caries prevalence, dental erosion, sensitivity to percussion and mastication, tooth mobility and malocclusion.^{14,15,16}

METHODOLOGY

One hundred eighty Iranian patients on hemodialysis participated in the study, and were divided into three subgroups; those who have been on a dialysis for less than year; those who were on dialysis for 1 to 3 years; and those who received dialysis for more than 3 years. There are three renal dialysis centers located in this region namely; BO Ali Sina, Zakaria Razei, and Takestan Dialysis.

Four dental indices: the debris index (DI); the calculus index (CI); the plaque index (PI) and the gingival index (GI) were used. Data were compiled and analyzed by using 1-way analysis of variance (ANOVA).

The purpose of the study was to evaluate the gingival health of subjects on renal dialysis. The study did not include any invasive technique that might lead to contamination of these patients, since they require special consideration, most importantly with regard to excessive bleeding, risk of infection and medication used. Bleeding can be a significant problem in patients receiving dialysis due to their low hematocrit level, and also platelet disorders involving abnormal platelet aggregation. Radiographs were not available for this examination. The selection of a conventional sample with any control population depends on following ratios:

1. Age and sex matched subjects are difficult to select from general population having no sys-

TABLE 1: DESCRIPTION OF INDICES USED

<p>Debris Index</p> <ol style="list-style-type: none"> 0. No debris or stain present 1. Soft debris covering more than one third of the tooth surface, or the presence of extrinsic stains without other debris regardless of surface area covered. 2. Soft debris covering more than one third, but not more than two thirds of the exposed tooth surface. 3. Soft debris covering more than two thirds of the exposed tooth surface.
<p>Plaque Index</p> <ol style="list-style-type: none"> 0. No plaque in the gingival area. 1. A film of plaque adhering of the free gingival margin and adjacent area of the tooth. The plaque may be recognized only by running a probe across the tooth surface. 2. Moderate accumulation of soft deposits within the gingival pocket and on the gingival margin and/or adjacent tooth surface, which can be seen by the naked eye. 3. Abundance of soft matter within the gingival Pocket and/or I on the gingival margin and adjacent tooth surface.
<p>Calculus Index</p> <ol style="list-style-type: none"> 0. No calculus present 1. Supragingival calculus covering not more than one third of the exposed tooth surface 2. Supragingival calculus covering more than one third but not more two thirds of the exposed tooth surface or the presence of individual flecks of supragingival calculus around the cervical portion of the tooth or both. 3. Supragingival calculus covering more than two thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.
<p>Gingival Index</p> <ol style="list-style-type: none"> 0. Normal gingiva 1. Mild inflammation, slight change in color, slight edema, bleeding on palpation 2. Moderate inflammation, redness, edema, and glazing, bleeding on palpation 3. Severe inflammation, marked redness and edema, ulceration, tendency to spontaneous bleeding. Only one examiner performed the assessment on all the renal dialysis patients.

temic disease with similar level of periodontal status of oral hygiene.

2. It is a cross sectional study to find out the gingival health level subjects undergoing hemodialysis.
3. Control group will not be from selection bias as selection of the selected population may not be representative.

The moderate number of patients was due to the fact that other medical centers did not allow investigators to have access to the patients for the study purpose.

RESULTS

Out of one hundred eighty participants 106 were females (58.9%), 74 were males (41.1%). The mean ages were 42.9, 46.7 and 47.2 years for the 1st, 2nd, and 3rd

TABLE 2: DESCRIPTIVE STATISTICS FOR DEBRIS INDEX SCORES FOR INDIVIDUALS ON RENAL DIALYSIS (N=180)

Patients Category (Years)	N	Mean	SD	95% Confidence Interval for Mean		Range	
				Lower Bound	Upper Bound	Minimum	Maximum
<1	60	1.6500	.6786	1.3966	1.9034	.33	2.83
1-3	60	2.0667	.34767	1.8887	2.2447	1.77	2.83
>3	60	2.1500	.34822	1.9700	2.3300	1.73	2.83
Total	180	1.9556	.5901	1.8320	2.0791	.33	2.83

TABLE 3: DESCRIPTIVE STATISTICS FOR PLAQUE INDEX SCORES FOR INDIVIDUALS ON RENAL DIALYSIS (N=180)

Patients Category (Years)	N	Mean	SD	95% Confidence Interval for Mean		Range	
				Lower Bound	Upper Bound	Minimum	Maximum
<1	60	1.7167	.6435	1.4764	1.9570	.50	2.83
1-3	60	2.1611	.3622	2.0259	2.2964	1.67	3.00
>3	60	2.2556	.4215	2.0982	2.4129	1.33	3.00
Total	180	2.0444	.5398	1.9314	2.1575	.50	3.00

TABLE 4: DESCRIPTIVE STATISTICS FOR CALCULUS INDEX SCORES FOR INDIVIDUALS ON RENAL DIALYSIS (N=180)

Patients Category (Years)	N	Mean	SD	95% Confidence Interval for Mean		Range	
				Lower Bound	Upper Bound	Minimum	Maximum
<1	60	1.5778	.5819	1.3605	1.7951	.50	2.50
1-3	60	2.0167	.2882	1.9091	2.1243	1.50	2.50
>3	60	2.0889	.3908	1.4930	2.2348	1.17	2.67
Total	180	1.8944	.4886	1.7921	2.9968	.50	2.67

TABLE 5: DESCRIPTIVE STATISTICS FOR GINGIVAL INDEX SCORES FOR INDIVIDUALS ON RENAL DIALYSIS (N=180)

Patients Category (Years)	N	Mean	SD	95% Confidence Interval for Mean		Range	
				Lower Bound	Upper Bound	Minimum	Maximum
<1	60	1.4278	.6776	1.1748	1.6808	.00	2.50
1-3	60	2.9667	.3801	1.8248	2.1086	1.33	2.83
>3	60	2.0556	.3565	1.9224	2.1887	1.33	2.67
Total	180	1.8167	.5620	1.6990	1.9344	.00	2.83

TABLE 6: TUKEY'S POST HOC TEST TO COMPARE SUBGROUPS

	P-value			
	Plaque index	Debris index	Calculus index	Gingival index
Group 1 Vs. 1	0.02	<0.001	0.01	0.02
Group 1 Vs. 3	<0.001	<0.001	<0.001	0.02
Group 2 Vs. 3	.737	.766	.799	0.830

subgroups respectively. The means of DI were 1.65, 2.07 and 2.15 respectively for the 1st, 2nd, and 3rd subgroup respectively. (Table 2) The means of PI were 1.72, 2.16 and 2.26 for the same subgroups respectively. (Table 3) The means of Calculus index (CI) were 1.58, 2.02 and 2.09 for the same subgroups respectively (Table 4). Finally, the means of GI were 1.42, 2.97 and 2.06 for the same subgroups respectively. (Table 5) One way analysis of variance (ANOVA) was used to determine significant differences in the 4 indices among the 3 subgroups at 5% level. Tukey's post hoc test was used to compare between subgroups Table 6. There was significant difference between subgroup I and subgroups 2 where p-values were 0.02, 0.001, 0.01 and 0.02 for PI, DI, CI and GI respectively There was significant difference between subgroup 1 and subgroup 3 where P values were 0.001, 0.001, 0.001 and 0.02 for PII, DI, CI and GI respectively. No significant difference was found between subgroup 2 and subgroup 3 where P values .737, .766 and .830 for II, DI, CI and GI respectively.

DISCUSSION

Klassen and Krasko¹⁷ in a study evaluating the dental health status of dialysis patients, found that the renal patients had worse oral hygiene than healthy

control patients, presenting greater calculus formation, gingivitis and larger number of caries lesions. They evaluated 45 patients undertaking hemodialysis and reported that 100% of them presented some type of periodontal disease, 64% severe gingivitis and 28% had early periodontitis regardless of the duration of dialysis. In another study with 44 dialysis patients, periodontal disease (i.e, severe gingivitis characterized by marked redness, inflammation, bleeding and ulcers) was present in all cases.¹⁸

The renal dialysis sample studied showed 100% prevalence of mild to moderate gingivitis which is greater than the prevalence of periodontal disease (85%) found in general population. This finding is in agreement with other studies.¹⁴ Both plaque and debris indices revealed unacceptable level of the findings of Bottomley et al¹⁴ suggested that a stringent continued care program should be established to prevent oral disease from progressing undetected. The debris index revealed that comprehensive oral hygiene instructions are required to improve oral self-care behaviors and to prevent the initiation and progression of future dental disease. Eigner et al¹⁹ recommended that demonstration of brushing and flossing, and the use of topical fluorides are necessary in conjunction with professional care.

There was positive correlation between the presence of calculus and the prevalence of gingivitis. Calculus is always covered with nonmineralized layer of plaque. The calculus index in this study revealed that scaling and root planning was required to eliminate the bacterial deposit. Epstein et al⁵ reported that calculus in dialysis patients was of greater thickness than in those individuals who were not medically compromised. High urea levels may be a factor in heavy calculus formation. The patients were divided into three groups based on how long they have been on hemodialysis to see if there was any effect of hemodialysis duration. Tukey's post hoc test showed a significant difference between the 1st and 2nd subgroups, and between the 1st and 3rd subgroups. That may be explained on the basis of chronic nature of the illness. Patients are preoccupied with their main disease and tend to neglect preventive measures, in addition to the psychological changes due to toxic, metabolic and degenerative changes. The severe stress of frustrating dietary and drinking restrictions were found to contribute to anxiety reaction or depression.

It was concluded that dialysis patients should receive oral health care before the beginning or at least within 1 month of their first dialysis treatment. They should also be informed regarding the possible complication of failing to maintain oral health. All dialysis patients should receive initial oral examinations with follow-up care, including periodontal therapy and restorative treatment within 6 months of their initial dialysis treatment. Besides, they should also receive periodical supportive therapy.

The oral health maintenance program for patients receiving dialysis should be reinforced by the dialysis team and the dentists. Otherwise oral pathologies and infections could jeopardize the opportunity to receive a successful kidney transplant.²⁰

CONCLUSIONS

Result of the study showed a 100% prevalence of mild to moderate gingivitis among the studied population. Individuals on hemodialysis showed a low level of oral hygiene as demonstrated by plaque and debris indices. Tukey's post Hoc test showed significant effect of the duration of patients on dialysis.

Subjects on hemodialysis should receive initial comprehensive oral examination with oral hygiene instructions. All patients should receive periodic supportive periodontal care. The oral health maintenance should be reinforced by the dialysis team. Members of the team may require some further training to perform this role adequately.

ACKNOWLEDGEMENT

I would like to express my appreciation to Dr. Jebrael Yousefi for his assistance in the project. The author wish to thank Mrs Qudossi for her assistance with statistical analysis. In addition, the authors also wish to thank the Head Division and staff of the Renal Dialysis department in Qazvin University Hospitals, Qazvin for their help and support. I should also like to thank patients without whose enthusiasm and willing cooperation this investigation could not have been possible.

REFERENCES

- 1 Rossi SS, Glick M. dental Considerations for the patients with renal disease receiving hemodialysis. *J Am Dent Assoc.* 1996; 19:127-211.
- 2 Ferguson CA, Whyman RA. Dental management of people with renal disease and renal transplants. *N Z Dent J.* 1998;94:125-30.
- 3 Proctor R, Kimar N, Stein A, Moles D, Porter S. Oral and dental aspects of chronic renal failure. *J Dent Res.* 2005;84: 199-208.
- 4 Levy H, M. Dental consideration for the patient receiving dialysis for renal failure. *Spec Care Dent.* 1988; 34-36.
- 5 Epstein SR, Mandel I and Scopp IW. Salivary composition and calculus formation in patients undergoing hemodialysis. *J Periodontol.* 1980;51:336-39.
- 6 Isselbacher KJ, Braunwald W and Wilson JD Disorders of the kidney and urinary tract. In, *Harrison's principles of internal medicine.* 12th Ed, New York: McGraw-Hill 1991; 1251-336.
- 7 Greenwood M, Meechan JG, Btayant DG. General medicine and surgery for dental practitioners Part 7. *Br Dent J.* 2003;195:181-184.
- 8 Proctor R, Kumar N, Stein A, Moles D, Porter S. Oral and dental aspects of chronic renal failure. *J Dent Res.* 2005;84: 199-208.
- 9 Kalyvas D, Tosios KL, Leventis MD, Tsiklakis K, Angelopoulos AP. Localized jaw enlargement in renal osteodystrophy: re-

- port of a case and review of the literature. *Oral surg Oral Med Oral Pathol Oral Radiol Endod* 2004;97:68-74.
- 10 Deyken D. Uremic bleeding. *Kidney Int* 1884;24:698-705.
- 11 Green JC and Vermillion JR. The simplified oral hygiene index. *J AmDent Assoc* 1964;68:7-13.
- 12 Silness P and Loe H. Periodontal disease in pregnancy. *Acta Odontol Scand* 1964;2:121-551.
- 13 Loe H and Silness J. Periodontal disease in pregnancy. *Acta Odontol Scand* 1962;21:533-51.
- 14 Bottomley WK, Cioffi RF, Martin AJ. Dental management of the patient treated by renal transplantation: preoperative considerations. *J Am Dent Assoc* 1972;85:1330-35.
- 15 Naylor GD, Fredericks MR. Pharmacologic considerations in the dental management of the patient with disorders of the renal system. *Dent Clin North Am* 1996;40:665-83.
- 16 Heard E Jr, Staples AF, Czerwinski AW. The dental patients with renal disease. Precautions and guidelines. *J Am Dent Assoc* 1978;96:792-96.