

# Effect of end-stage renal disease on oral health in patients undergoing renal dialysis: A cross-sectional study

Nalam Radhika Gautam, Nalam Sai Gautam<sup>1</sup>, Thota Hanumantha Rao<sup>2</sup>, Ravichandra Koganti<sup>3</sup>, Rohit Agarwal, Madhavi Alamanda<sup>4</sup>

Department of Public Health Dentistry, Rungta College of Dental Sciences and Research, Bhilai, Chattisgarh, <sup>1</sup>Department of Pedodontics and Preventive Dentistry, GITAM Dental College and Hospital, Rushikonda, Visakhapatnam, Andhra Pradesh, <sup>2</sup>Departments of Periodontics and <sup>3</sup>Oral and Maxillofacial Surgery, Kalinga Institute of Dental Sciences, Bhubaneswar, Odisha, <sup>4</sup>Department of Periodontics, Ahmedabad Dental College, Ahmedabad, Gujarat, India

Corresponding author (email: <radhikagautham15@gmail.com>)

Dr. N Radhika Gautham, Department of Public Health Dentistry, Rungta College of Dental Sciences, Bhilai, Chattisgarh, India.

## Abstract

**Aims and Objectives:** To evaluate the effect of chronic renal failure on oral health in renal dialysis patients. To assess and improvise awareness of staff regarding oral health care of the patients in hemodialysis unit.

**Materials and Methods:** A cross-sectional questionnaire survey and oral health examination study were conducted on 206 end-stage chronic renal failure patients (stage V) who were undergoing renal dialysis in Guntur city. The study included the questionnaire form and modified WHO proforma to record their oral health status. Oral examination was done in American Dental Association (ADA) type III method by using mouth mirror and community periodontal index (CPI) probe. Questionnaire survey was conducted among the nursing staff in the hemodialysis unit. **Results:** Mean age of the study subjects was  $46.79 \pm 12.78$  years; 81.1% were males and 18.9% were females. Candidiasis (8.3%) was the most frequently seen oral mucosal condition in these subjects. Majority of the subjects (44.2%) showed periodontal diseases (CPI score 3: Pocket depth of 4-5 mm). Caries prevalence of 56.3% was seen in this study group. Higher incidence of hepatitis C was significantly associated with higher duration of dialysis. There was very little awareness among the nursing staff regarding dental care. **Conclusion:** There is greater deterioration of periodontal health among dialysis patients with chronic renal disease. Awareness regarding dental care is very less among patients undergoing renal dialysis. These patients should be monitored carefully to maintain their oral health. Awareness must be increased among dialysis patients and nursing staff about the need for primary prevention of dental diseases.

**Key words:** Chronic renal failure, oral health status, oral hygiene habits, renal dialysis patients

## INTRODUCTION

Oral health is an integral and critical part of general health. Several changes occur in the oral cavity in patients with chronic renal failure. Researchers estimate

that up to 90% patients with renal disease show oral symptoms.<sup>[1]</sup> Chronic renal failure (CRF) can affect the oral tissues and lead to gingival enlargement, xerostomia, and alterations in salivary composition and flow rate.<sup>[2]</sup>

Access this article online	
Quick Response Code:	Website: <a href="http://www.jispcd.org">www.jispcd.org</a>
	DOI: 10.4103/2231-0762.142006

Renal failure is an uncommon condition compared with ischemic heart disease, stroke, diabetes, and cancer and, therefore, may appear to be a relatively minor public health problem. Renal failure is a process that expresses a loss of functional capacity of the nephrons, independently of its etiology. It is classified into acute, subacute, and chronic renal failure, based on its form of onset and, above all, on the possibilities for recovery

of the structural lesion. Although acute renal failure is reversible in the majority of cases, CRF presents a progressive course toward terminal renal failure (TRF), even if the cause of the initial nephropathy disappears.<sup>[3]</sup>

The most common oral finding is pallor of oral mucosa secondary to anemia, commonly seen in patients with renal failure who are undergoing hemodialysis.<sup>[4]</sup> Periodontal disease, manifesting as gingival inflammation, is minimal in this group perhaps because immunosuppression and uremia may both inhibit periodontal tissue reaction to plaque stimulation.<sup>[5]</sup> Gingival overgrowth, due to overproduction of gum tissue by fibroblasts, is a side effect of some drugs, including nifedipine and cyclosporin, and may be the site of local carcinoma.<sup>[6]</sup> Disturbed calcium and phosphate metabolism may cause enamel opacities, loss of lamina dura, loosening of teeth, bony fractures, and bone tumors from secondary hyperparathyroidism.<sup>[7]</sup> Renal failure is associated with a reduced prevalence of caries, perhaps linked to an altered oral pH.<sup>[8]</sup>

For the dental treatment of these patients, good communication with their nephrologist is highly recommended, in order to be aware of the stage of the pathology suffered and the treatment prescribed. Before any invasive dental procedure, possible hematologic problem in the patient should be studied. It is essential to remove any infective foci as soon as possible. Due to the frequent hypertension, blood pressure should be monitored during the procedures. When prescribing drugs, those that are nephrotoxic must be avoided (tetracyclines, aminoglycosides); some of them need a dose adjustment. Apart from these considerations, no more exceptional measures must be performed.<sup>[9]</sup>

The present study was done to evaluate the oral disease burden among these patients in order to promote their oral health and improve their quality of life.

## MATERIALS AND METHODS

A cross-sectional questionnaire survey and oral health examination study were conducted on 206 terminal stage CRF patients (stage V) who were undergoing renal dialysis in three hospitals in Guntur city (Government General Hospital, Krishna Institute of Medical Sciences, and Aswini Hospitals).

A representative sample of all the patients attending these hospitals for dialysis during the period of 4 months (from March 2011 to June 2011) was included in the study.

Questionnaire survey was done on 21 nursing staff. Awareness regarding oral hygiene and primary prevention was tested by a questionnaire which consisted of questions regarding oral hygiene knowledge, attitude, and practices [Figure 1].

### Inclusion criteria

Patients who were suffering from CRF stage V with glomerular filtration rate (GFR) <15 ml/min/1.73 m<sup>2</sup> and patients who were ready to consent and participate were included in the study.

### Exclusion criteria

Patients who were critically ill and patients undergoing renal dialysis for reasons other than CRF, such as acute renal failure, accidents, trauma, snake poisoning, etc., were excluded from the study.

Questionnaire	Tick the right options
Causes of dental decay	Bacteria Calculus Food Systemic disease Smoking Genetic factor
How to prevent dental decay	Good oral hygiene Toothbrushing Regular dental check-up Avoid sweets
Do you know the role of fluoride in dental caries?	Decreasing dental caries Increasing dental caries None of the above
Causes of gum disease	Bacteria Calculus Food Systemic disease Smoking Genetic factor
Signs of gum disease	Teeth fall out Painful gum Bleeding gum
How to treat gum disease	Antibiotic Self-heal Scaling
You learn to clean your teeth mainly from	Teachers Parents Dentist Mass media
Importance of your teeth	Very important Important
General condition of your teeth	Good Average Not good
Did you refer any patient for dental treatment before?	Yes No

**Figure 1:** Questionnaire to evaluate knowledge and attitude of nursing staff

Before the commencement of the study, the patients were clearly explained the purpose of the study. Prior consent was obtained by the respective hospital in-charge from the patients or their guardians. Prior permission was obtained from the Principal of SIBAR Institute of Dental Sciences and the Head of the Department of Public Health Dentistry. The research protocol was approved by the Ethical Clearance Committee of SIBAR Institute of Dental Sciences.

The study included a questionnaire form and modified WHO proforma to record the oral health status.

The questionnaire was given to collect information regarding the patients' demographic details, past medical history, dental history, and to assess their oral hygiene habits. It was filled by the examiner as the patients were physically unable to fill the proforma.

The questionnaire was divided into four parts consisting of demographic details (name, sex, age, address, educational level, occupation, income details, and personal habits like smoking and alcohol), past medical history (details regarding patient's systemic diseases, diagnosis, dialysis modality, dialysis duration, and medication), patient's past dental history, and oral hygiene practices.

The findings were recorded in modified WHO Oral Health Assessment Form 1997, which included details regarding oral mucosa condition and location, community periodontal index (CPI), loss of attachment, dentition status, and treatment needs.

Statistical analysis was done using SPSS software version 15.0. Chi-square test and Fisher exact test were used for comparison of categorical data. Level of significance was set at  $P < 0.05\%$ .

## RESULTS

The mean age of study subjects was  $46.79 \pm 12.78$  years and 81.1% were males and 18.9% were females. Sixty-nine percent of them were undergoing dialysis for less than 1 year; 60.7% had experienced past dental pain/problem while only 76% of them had taken treatment for the same in the past. 54.9% never visited a dentist before and 87.4% do not visit dentist regularly. 92.7% brush their teeth once in a day, while 92.2% rinse their mouth with water. Oral health variables and their distributions, macroglossia (6.79%) and candidiasis (8.3%) were the frequently seen oral mucosal conditions in the study subjects [Table 1]. Caries prevalence of 56.3% was seen in this study

group [Table 2]. Low educational level and lesser dialysis time had a significantly higher DMFT score. Periodontal condition of these patients was measured by CPI. Majority of the subjects (44.2%) showed a CPI score of 3 (pocket depth of 4-5 mm) [Table 3]. Higher incidence of hepatitis C was significantly associated with higher duration of dialysis [Figure 2]. The questionnaire survey regarding the knowledge and attitudes of nursing staff showed that there was lack of knowledge related to oral health among the nursing staff.

**Table 1: Distribution of study subjects according to oral mucosal conditionw**

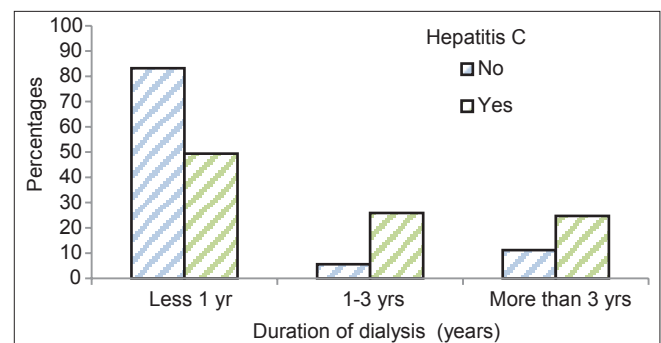
Condition	Number	Percentage
No abnormal condition	166	80.6
Lichen planus	4	1.9
Ulceration	4	1.9
Candidiasis	17	8.3
Macroglossia	14	6.79
Smoker's melanosis	2	0.9
Total	206	100

**Table 2: Distribution of study subjects according to dental caries prevalence**

Dental caries	Number of patients	Percentage
Caries not present	90	43.7
Caries present	116	56.3
Total	206	100.0

**Table 3: Distribution of study subjects according to community periodontal index scores**

CPI score	Number of patients (N=206)	Percentage
Bleeding	0	0.0
Calculus	27	13.1
Pocket 4-5 mm	91	44.2
Pocket 6 mm or more	81	39.32
Not recorded	7	3.4



**Figure 2:** Distribution of study subjects according to the presence of hepatitis C in relation to duration of dialysis

## DISCUSSION

The present study was done to evaluate the effect of CRF on the oral health of renal dialysis patients in Guntur city.

Gender wise distribution showed that the number of females was 39 (18.9%) and the number of males was 167 (81.1%), and the mean age of the patients was  $46.79 \pm 12.77$  years. Majority of the subjects were in the age group of 31-60 years. The mean age of CRF patients in the study conducted by Modi and Jha was 47 years.<sup>[10]</sup> We noticed an age-related decline in GFR, indicating that the prevalence of chronic kidney disease increases with age. Approximately 17% of people older than 60 years have an estimated GFR of less than 60 ml/min/1.73 m<sup>2</sup>.<sup>[11]</sup>

The distribution of study subjects according to socio-economic status is based on modified Kuppuswamy scale, 2007.<sup>[12]</sup> The number of patients belonging to upper, upper middle, lower middle, upper lower, and lower class was 0 (0%), 95 (46.1%), 62 (30.1%), 48 (23.3%), and 1 (0.5%), respectively [Table 4]. Most of the subjects belonged to upper middle class [95 (46.1%)].

In the present study, the number of patients with diabetes, hypertension, both diabetes and hypertension, and glomerulonephritis was 66 (32.03%), 188 (91.26%), 56 (27.18%), and 3 (1.47%), respectively. Other diseases like respiratory diseases, cardiac problems, etc., constituted 12 (5.82%) subjects [Table 5].

These values are far higher than the values obtained by Gavalda *et al.*,<sup>[2]</sup> which showed that the pathology causing CRF in hemodialysis patients was due to diabetic nephropathy in 6.8%, vascular nephropathy in 10.2%, and primary glomerulonephritis in 10.2% of the subjects. In a study conducted by Garcez *et al.*,<sup>[13]</sup> hypertension was seen in 13.8% of the subjects with a mild decrease in GFR and diabetes was seen in 3.8% of the same subjects. Variations can be encountered in diabetes depending upon the rural/urban divide, the level of economic development, and the genetic background of the population.<sup>[10]</sup>

Hepatitis C was seen in 82 subjects (39.8%), whereas hepatitis B was seen in 8 (3.88%) subjects [Table 5]. Hepatitis C prevalence in the South-East Asian region was 2.15% according to a WHO report.<sup>[14]</sup> High prevalence of hepatitis C can be attributed to blood transfusion. Patients on hemodialysis are at an increased risk for acquiring

**Table 4: Distribution of study subjects according to socio-economic status**

Socio-economic status	Number of patients	Percentage
Upper class	0	0.0
Upper middle	95	46.1
Lower middle	62	30.1
Upper lower	48	23.3
Lower	1	0.5
Total	206	100.0

**Table 5: Distribution of study subjects according to history of underlying systemic diseases**

Systemic disease	Number of patients	Percentage
Diabetes	66	32.03
Hypertension	188	91.26
Diabetes and hypertension	56	27.18
Hepatitis C	82	39.80
Hepatitis B	8	3.88
Glomerulonephritis	3	1.47
Others	12	5.82

hepatitis C infection as a result of cross-contamination from the dialysis circuits. In addition, these patients are often anemic and require multiple blood transfusions.<sup>[15]</sup> In a study from Hyderabad that comprised both renal transplant and renal failure patients on hemodialysis, the hepatitis C prevalence was as high as 46%.<sup>[16]</sup> In a study from Delhi, the prevalence of hepatitis C in 208 patients undergoing hemodialysis was found to be 4.3%.<sup>[17]</sup> Stringent blood testing and isolation of dialysis machines have helped in reduction of hepatitis C transmission. Hepatitis B was seen in 7% of the patients undergoing renal dialysis ( $n = 256$ ) in a study conducted by Chandra.<sup>[16]</sup>

In this study, the subjects were subdivided into three groups based on the duration for which they were undergoing dialysis. Patients who were undergoing dialysis for less than 1 year (group 1), 1-3 years (group 2), more than 3 years (group 3) numbered 143 (69.4%), 29 (14.1%), and 34 (16.5%), respectively. Less number of patients was seen in group 3 probably due to increased risk of mortality as the disease advances.

Distribution of patients according to dental care utilization among the patients in the past revealed that only 93 (45.1%) of them visited a dentist before. Dental care utilization among these patients is very less and this pattern can be partly explained by the reason that more importance is given to the treatment of systemic diseases rather than dental problems, and also, it may be

**Table 6: Distribution of study subjects according to CPI scores by duration of dialysis**

Duration of dialysis	Number of patients (%)	CPI			
		Bleeding	Calculus (%)	Pocket 4-5 mm (%)	Pocket 6 mm or more (%)
Less 1 year	144 (69.9)	-	19 (70.4)	63 (69.2)	56 (69.1)
1-3 years	28 (13.6)	-	4 (14.8)	13 (14.3)	11 (13.6)
More than 3 years	34 (16.5)	-	4 (14.8)	15 (16.5)	14 (17.3)
Total	206 (100)	-	27 (100)	91 (100)	81 (100)
Inference	Duration of disease is not statistically associated with CPI score with $P=0.999$				

CPI: Community periodontal index

due to lack of awareness, physical barriers, etc., As most of these patients come from rural areas where dental services are seldom available, lesser utilization of dental care can be explained. In a study conducted by Klassen and Krasko in 2002, dental care in dialysis patients was found to be neglected.<sup>[18]</sup>

Oral mucosal lesions were seen in 42 (20.3%) subjects. Of these, candidiasis, lichen planus, ulcerations, macroglossia, and smoker's melanosis were seen in 17 (8.25%), 4 (1.94%), 4 (1.94%), 14 (6.79%), and 2 (0.9%) subjects, respectively [Table 1]. Gavalda *et al.* examined the oral mucosa of individuals with CRF and noted several mucosal lesions like uremic stomatitis and candidal infections in 37% of these patients.<sup>[2]</sup> Candidiasis occurs in CRF patients as their host defense is compromised by changes in production and function of white blood cells and nutritional deficiencies.<sup>[19]</sup>

Hemodialysis patients are repeatedly exposed to systemic anti-coagulation with high-dose heparin during blood purification procedures. This will predispose them further to gingival bleeding and facilitate bacterial colonization and growth, and may propagate periodontal disease.<sup>[20]</sup>

In the present study, prevalence of dental caries was 56.3% [Table 2]. It is very much less than the values obtained in the National Oral Health Survey (2002-2003)<sup>[21]</sup> where the caries prevalence in the age groups 35-44 years and 65-74 years was 79.2% and 84.7%, respectively. Lower mean DMFT in the present study can be attributed to higher salivary pH values as a result of reduced urea clearance. Correlation of duration of the disease with loss of attachment scores showed that the subjects with a history of renal dialysis for less than 1 year had a more favorable, although not significant, periodontal status than the subjects who had undergone renal dialysis for more than 1 year or 3 years [Table 6]. This is in accordance with the results of Al-Wahdani and Al-Omari.<sup>[22]</sup> Periodontal management of the medically compromised patients requires acquisition of complete health history as well as dental history of the patient.<sup>[23]</sup>

CRF results in a gradual impaired host defense, and it is conceivable that patients with a hemodialysis history of more than 1 year have a more impaired host response, and hence greater levels of periodontal disease.<sup>[24]</sup>

In our study it was seen that there was lack of knowledge related to oral health among the nursing staff; their attitude and practices were also poor. Oral health education was given to the nursing staff to improve their knowledge in primary prevention. Nursing personnel are an important component of hospitals in giving care to hospitalized patients.

## CONCLUSION

There is greater deterioration of periodontal health among dialysis patients with chronic renal disease. Prevalence of hepatitis C is more in renal dialysis patients. Awareness regarding dental care is very less among these people. These patients should be monitored carefully to maintain their oral health. Awareness must be increased among dialysis patients and nursing staff about the need for primary dental prevention.

## REFERENCES

1. De Rossi SS, Glick M. Dental considerations for the patient with renal disease receiving hemodialysis. *J Am Dent Assoc* 1996;127:211-9.
2. Gavalda C, Bagán J, Scully C, Silvestre F, Milián M, Jiménez Y. Renal hemodialysis patients: Oral, salivary, dental and periodontal findings in 105 adult cases. *Oral Dis* 1999;5:299-302.
3. Sobrado Marinho JS, Tomás Carmona I, Loureiro A, Limeres Posse J, García Caballero L, Diz Dios P. Oral health status in patients with moderate-severe and terminal renal failure. *Med Oral Patol Oral Cir Bucal* 2007;12:E305-10.
4. Saini R, Sugandha, Saini S. The importance of oral health in kidney diseases. *Saudi J Kidney Dis Transpl* 2010;21:1151-2.
5. Thomason JM, Seymour RA, Ellis J. The periodontal problems and management of the renal transplant patient. *Ren Fail* 1994;16:731-45.
6. Bökenkamp A, Bohnhorst B, Beier C, Albers N, Offner G, Brodehl J. Nifedipine aggravates cyclosporine A-induced gingival hyperplasia. *Pediatr Nephrol* 1994;8:181-5.
7. Nunn JH, Huntley N, Lad A, Gordon PH. Assessment of dental

- maturity from radiographs in children with renal disease and a control group. *J Dent Res* 1995;74(Suppl):855.
8. Obry F, Belcourt A, Frank RM, Geisert J, Sommermater J, Fischbach M. Low caries activity and salivary pH in youngsters dialyzed for chronic renal failure. *J Biol Buccale* 1984;12:181-6.
  9. Álamo SM, Esteve CG, Pérez MG. Dental considerations for the patient with renal disease. *J Clin Exp Dent* 2011;3:e112-9.
  10. Modi GK, Jha V. The incidence of end-stage renal disease in India: A population-based study. *Kidney Int* 2006;70:2131-3.
  11. Johnson CA, Levey AS, Coresh J, Levin A, Lau J, Eknoyan G. Clinical practice guidelines for chronic kidney disease in adults: Part I. definition, disease stages, evaluation, treatment, and risk factors. *Am Fam Physician* 2004;70:869-76.
  12. Kumar N, Shekhar C, Kumar P, Kundu AS. Kuppuswamy's socioeconomic status scale-updating for 2007. *Indian J Pediatr* 2007;74:1131-2.
  13. Garcez J, Limeres Posse J, Carmona IT, Feijoo JF, Diz Dios P. Oral health status of patients with a mild decrease in glomerular filtration rate. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009;107:224-8.
  14. WHO. Global surveillance and control of hepatitis C. Report of a WHO Consultation organized in collaboration with the Viral Hepatitis Prevention Board, Antwerp, Belgium. *J Viral Hepat* 1999;6:35-47.
  15. Mukhopadya A. Hepatitis C in India. *J Biosci* 2008;33:465-73.
  16. Chandra M, Khaja MN, Hussain MM, Poduri CD, Farees N, Habeeb MA, *et al.* Prevalence of hepatitis B and hepatitis C viral infections in Indian patients with chronic renal failure. *Intervirology* 2004;47:374-6.
  17. Agarwal SK, Dash SC, Irshad M, Raju S, Singh R, Pandey RM. Prevalence of chronic renal failure in adults in Delhi, India. *Nephrol Dial Transplant* 2005;20:1638-42.
  18. Klassen JT, Krasko BM. The dental health status of dialysis patients. *J Can Dent Assoc* 2002;68:34-8.
  19. Kho HS, Lee SW, Chung SC, Kim YK. Oral manifestations and salivary flow rate, pH, and buffer capacity in patients with end-stage renal disease undergoing hemodialysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1999;88:316-9.
  20. 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;22:457-64.
  21. Bali RK, Mathur VB, Talwar PP, Chanana HB. National Oral Health Survey and Fluoride Mapping, 2002-2003, India. 1<sup>st</sup> ed. New Delhi: Dental Council of India and Ministry of Health and Family Welfare, Government of India; 2004.
  22. Al-Wahadni A, Al-Omari MA. Dental diseases in Jordanian population on renal dialysis. *Quintessence Int* 2003;34:343-7.
  23. Shah M, Dave D, Dave R, Bharwani A, Shah A. Management of medically compromised patient in periodontal practice: An overview (Part 1). *Adv Hum Biol* 2013;3:1-6.
  24. Chamani G, Zarei MR, Radvar M, Rashidfarrokhi F, Razazpour F. Oral health status of dialysis patients based on their renal dialysis history in Kerman, Iran. *Oral Health Prev Dent* 2009;7:269-75.

**How to cite this article:** Gautam NR, Gautam NS, Rao TH, Koganti R, Agarwal R, Alamanda M. Effect of end-stage renal disease on oral health in patients undergoing renal dialysis: A cross-sectional study. *J Int Soc Prevent Communit Dent* 2014;4:164-9.

**Source of Support:** Nil, **Conflict of Interest:** None declared.