

Oral Health of Patients with Chronic Kidney Disease Undergoing Hemodialysis

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Abstract

Background: The association between oral diseases and kidney diseases are not satisfactorily reported in population of Basrah city in Iraq. The aim of the study was to assess and compare the oral health of patients with chronic kidney disease on maintenance hemodialysis with systemically healthy individuals. Materials and methods: Study of 100 subjects, 50 patients with chronic kidney disease on maintenance hemodialysis who were referred from hemodialysis Clinic at Basrah Nephrology and Transplantation Center and 50 patients without chronic kidney disease who consult the dental clinic (control group). Oral health assessment includes two parts: index for dental caries (DMFT index), and index for periodontal health (CPI). Results: Results illustrate that periodontal disease was more sever in patients with CKD, this difference between two groups was statistically significant ($P < 0.05$). Regarding the caries incidence, (DMFT) mean value in CKD group (4.48) was lower than in controlled (8.42) but no statistically significant difference was found ($P > 0.05$).

Keywords

chronic kidney disease, oral health status, periodontal disease, CPI, DMFT.

Renal failure is the failure of kidneys to perform their excretory and endocrine functions independent of their etiology. It is either acute kidney injury or chronic kidney disease, depending on disease onset (1).

Chronic kidney disease (CKD) may advance to end stage kidney disease (ESD) needing renal replacement therapy (either dialysis or kidney transplant) (2).

Accumulation of waste products manifested clinically as uremic symptoms with perturbations of electrolytes and acid-base abnormalities affect many body organs; removal of uremic toxins with dialysis therapy, whether hemodialysis or peritoneal dialysis, may improve uremic symptoms and quality of life (3). Dialysis is one form of therapy that helps relieve symptoms and reduce morbidity and mortality (4). Oral health is a mirror of the general health of the

body. Chronic diseases such as chronic kidney disease may affect the oral cavity similar to other parts of the body (5,6). Patients with CKD are more liable for the development of oral complications, such as decreasing in the size of pulp chamber, xerostomia, abnormalities in the enamel and early loss of tooth in comparison to healthy individuals (7-9).

Dental caries is defined as an irreversible process of demineralization and dissolving of the inorganic and organic dental tissues respectively resulting in a cavity formation caused by a microbial factor (10).

Periodontal disease is a chronic destructive, inflammatory, and infectious disease, in which anaerobic gram-negative bacteria is the predominant causative microorganism (11,12).

Few studies were performed on oral health assessment in patients with (CKD), and to our knowledge, no comparative studies on patients without (CKD) were performed.

The aim of the study was to assess and compare the oral health of patients with chronic kidney disease on maintenance hemodialysis with systemically healthy individuals.

Patients And Methods

This was a comparative study conducted on patients with oral diseases attending Dental Clinic at University of Basrah/College of Dentistry from the period of October 2021 to October 2022. The study was approved by University of Basrah/College of Dentistry. Two groups were assigned, 50 patients with chronic kidney disease on maintenance hemodialysis who were referred from hemodialysis Clinic at Basrah Nephrology and Transplantation Center and 50 patients without chronic kidney disease who consult the dental clinic (control group).

Oral examination was performed under standardized condition in an appropriate room by using sickle shaped explorer, periodontal probe, plane dental mirrors with artificial light. A detailed

information was documented for all the participants. Complete privacy was provided to the patients. Estimation of oral condition include 2 parts: index for dental caries incidence, and index for periodontal condition. After taking history, intraoral examination was made by the same dentist, all teeth in the oral cavity were examined.

For the assessment of the dental condition DMFT index was applied (the dentist quantified sum of decayed (D), missed (M), and filled (F) teeth).

For the condition of periodontium CPI (Community Periodontal Index) was used including the following scores:

Score 0: Healthy periodontium.

Score 1: Bleeding on gentle probing.

Score 2: Calculus deposition.

Score 3: Probing depth of 4 to 5 mm.

Score 4: Probing depth 6 mm or deeper.

Score X: 3 or more missing teeth.

Statistical analyses with SPSS version 29 were performed using Chi square test to assess the differences between the two groups. P value <0.05 was considered statically significant.

Results

Condition of periodontium of all patients was measured by CPI. 48% of participants in CKD group (n=24) had Calculus deposition (Code 2), in comparison to 38% (n=19) in the healthy counterpart. Furthermore, 18% (n=9) of CKD patients demonstrate Bleeding on probing (Code 1), while on the contrary in the control group 56% (n=28) had (Code 1). For Code 0, it was not reported in any of the participants. 30% (n = 15) of CKD subjects had (Code 3) 4 to 5 mm Probing depth, with only 6% of subjects (n = 3) in the control group had (Code 3). For code 4 it was observed in (2) 4% of dialysis group, with (0) 0% in controlled group. The differences between the two groups were statistically significant (P < 0.05) (Table1).

Table1: Analysis of periodontal health (CPI) using chi-square test.

CPITN	CKD (%)	Control (%)	χ^2 -test	P value	Significance
Score 0	0%	(0) 0%	64.503a	0.000	S
Score 1	(9) 18%	(28) 56%			
Score 2	(24) 48%	(19) 38%			
Score 3	(15) 30%	(3) 6%			
Score X	(2) 4%	(0)0%			

The overall caries incidence (DMFT) seen in table 2, which showed that total DMFT score mean value in CKD group (4.48) was lower than in

controlled (8.42) but the result was statistically non-significant.

Table2: Analysis of caries incidence (DMFT) in CKD and control groups using Pearson Chi-Square

DMFT	Groups	Total number of individuals	Mean DMFT score	Standard deviation	χ^2 -test	p-value	Significance
	CKD	50	4.48	4.072	137.798a	0.630	NS
	Control	50	8.42	2.771			

Discussion

The prevalence of kidney diseases is high and rising all around the globe and is associated with a substantial disturbance to the quality of life. oral diseases can co-exist with chronic kidney disease (CKD), they seem to have a causal relationship to each other, which means the presence of one may initiate the onset and development of the other (13&14).

This study was performed to assess the effect of CKD on maintenance hemodialysis patients (50) and control group (50) in Basrah governorate.

The results of this study regarding periodontal condition were in agreement with other publications performed by Davidovich et al., (7) Marakoglu et al., (15) Naugle et al., (16), Marinho et al. (17) and Murthy et al., (18), which revealed that the periodontal disease was higher in patients with CKD.

This finding could be attributed to oral health neglect of patients under hemodialysis. Presence of other manifestations and complications of patients with CKD may keep care of oral health away from priority. Dialysis is lengthy procedure and often lowers patients' self-esteem. Dietary restrictions leave patient stressed and frustrated which may contribute to anxiety and depression. (19)

Patients on hemodialysis receives high-dose heparin during the procedure, this will increase

the chance of gingival bleeding and predispose to bacterial overgrowth and may cause periodontal disease (20).

The loss of renal function, in end stage CKD, causes accumulation of urea in both saliva and serum. Uremic comorbidities (including accumulation of uremic toxins, immune-suppression, water–electrolyte imbalance, normocytic and normochromic anemia, alteration of calcium–phosphorus metabolism and malnutrition) are plausible factors for oral health perturbations in CKD (21). This may lead to changes in a set of oral microbiotas that will be unable to protect patients from pathogenic bacteria, hence oral microbiota alteration could be a risk factor for the chronic non-communicable degenerative diseases CDNCDs onset (22).

On the other hand, the results regarding the differences in developing dental caries in CKD patients and healthy individuals, we found that the DMFT indices were lower in patients with CKD compared to healthy individuals, but not statistically significant. These results were in agreement with other publications performed by Davidovich et al., (7), Al-Nowaiser et al., (23), Wolff et al., (24), and Jaffe et al., (27).

This finding is against the expectations, especially in the setting of poor oral hygiene habits (23–25) and the dietary protein restrictions and liberal carbohydrate intake with consequent increased risk of developing caries (26–28).

Published data proposed that the saliva of patients with CKD may possess antibacterial properties, which is attributed to increased salivary pH, because of the salivary hydrolyzation of urea, suggesting anti-carious action (7). This mechanism will decrease the formation of plaque which will decrease caries formation (23,29). Some authors revealed decrement in number of *Streptococcus mutans* in patients with CKD which was blamed in initiation and development of dental decay (23,24).

Conclusion

Diseases of periodontium was more sever among CKD patients on hemodialysis as compared to the control individuals. While the incidence of dental caries in CKD patients was lower than that in their healthy counterparts. However, it was statistically insignificant.

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