

Comparison of Periodontitis between CKD and Non-CKD Patients: A Cross Sectional Study

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ABSTRACT

Objectives: The aim of this study is to evaluate the periodontal status and compare the prevalence of periodontitis between CKD and non-CKD patients.

Design: A comparative cross sectional study was conducted at Department of Conservative Dentistry & Endodontics of Bangabandhu Sheikh Mujib Medical University.

Materials and Method: Nephrology outdoor patients with CKD was considered as 1st group and non-CKD patient attending at dental outdoor of BSMMU was considered as 2nd group. The time period of the study was limited to 6 months. Purposive sampling technique was followed for selection of the study participants for two groups having 60 patients with CKD and 60 non-CKD patients in each group respectively. Informed consent was taken from the respondents before collecting the data. The relevant data was collected by face-to-face interview with a pretested semi-structured check list according to Community Periodontal Index of Treatment Needs (CPITN) which was introduced by WHO / FDI in 1982 and oral cavity was examined clinically to evaluate periodontal condition. The collected data was analyzed by Statistical Package for Social Sciences (SPSS) software (version 21) for Windows. Cross tabulation analysis was applied to compare periodontal status between CKD and non-CKD patients, pearson chi-square test was used when P-value less than 0.05 considered as statistically significant. In the present study, healthy periodontium, gingivitis and periodontitis were used as indicators of periodontal status of the study subjects and A total of 120 study subjects were selected out of which 60 (50%) were the CKD patients and 60 (50%) were the non-CKD subjects.

Results: Table 1 denotes that, healthy periodontium, gingivitis and periodontitis were used as indicators of periodontal status of the respondents and it was found that CKD patients had suffering of periodontitis and gingivitis 37% and 28% respectively it is found that 37% of CKD patients were suffering from periodontitis. On contrast, only 5% of non-CKD subjects had periodontal problems. Statistically significant differences were also observed between CKD and Non-CKD groups regarding periodontitis (p-value = .02).

Conclusion: This study reveals that patient with CKD have statistically significant greater frequency of periodontitis than non- CKD subjects. So, this current study concluded that there is a quite consistent evidence to support the positive association between periodontitis and CKD.

KEY WORDS

periodontitis, chronic kidney disease

INTRODUCTION

Periodontal disease has emerged as a non-traditional risk factor for CKD^{1,3)}. In internationally-representative cross-sectional surveys, there is increasing evidence of associations between CKD and periodontal disease, with a higher proportion of those with CKD having periodontal disease and vice versa^{2,9)}. Biological plausibility for considering peri-

odontal disease as a CKD risk factor is derived from the potential role of the inflammatory response to periodontal disease in the chronic systemic inflammatory burden (for example, increased C-reactive protein (CRP) levels) associated with CKD^{3,9)}.

The patient is in a state of uraemia which is accompanied by altered immune system because of impaired function of T- and B-lymphocytes as well as monocytes and macrophages, resulting in a decreased host response to the subgingiva. Gram-negative microbial challenge; uraemia

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Table 1: Distribution of periodontal status among respondents (n = 120)

Periodontal status indicator	Patients with CKD		Non-CKD patients	
	(n = 60)		(n = 60)	
	n	(%)	n	(%)
Healthy periodontium or gingivitis	21	35%	38	63%
Gingivitis	17	28%	19	32%
Periodontitis	22	37%	3	5%

Table 2: Cross tabulation of frequency of periodontitis in between CKD group and Non-CKD group (n = 120).

Variables	Patients with CKD		Non-CKD patients		P-value
	(n = 60)		(n = 60)		
	Yes	No	Yes	No	
Periodontitis	22 (37%)	38 (63%)	3 (5%)	57 (95%)	.02

*P-value < 0.05 is considered as significant difference value

might also be accounted for association of increased prevalence and severity of gingival inflammation and periodontitis with increased dialysis vintage⁵.

Other studies suggested that CKD patients are less prone to use oral hygiene procedures and to address oral healthcare resources because of the intense psychological burden and time-consuming treatment sessions in RRT patients^{6,7}. On the other hand, the local tissue destructive immuno-inflammatory response to periodontal pathogens, their products and inflammatory cytokines are believed to contribute to the chronic systemic inflammatory burden of periodontal disease^{8,9}.

Effect of CKD on periodontitis

It is a systemic condition which significantly affects oral hard and soft tissues^{10,11}. In the recent past, research work has been carried out regarding effects of CKD on oral tissues and the effect of oral diseases on worsening the prognosis of patients with CKD¹². Studies revealed that CKD affects teeth, oral mucosa, periodontium, salivary glands, and tongue resulting in a negative effect on the oral health status of the patient¹⁴. Increased levels of plaque have been reported for hemodialysis (HD) populations from several countries. The poor oral hygiene and increased level of plaque and gingival inflammation have been attributed to neglected oral care due to presence of CKD¹⁴.

Effect of periodontitis on CKD

A proposed mechanism for the effect of periodontitis on the development of kidney disease is systemic inflammation. Periodontal pathogens have been shown to have the ability to adhere to, invade, and proliferate in coronary endothelial cells and exert effects within the vasculature of the kidney^{14,15}. Both periodontitis and kidney diseases are associated with inflammatory markers such as C-reactive protein and chronic low level inflammation associated with periodontitis may lead to endothelial dysfunction which plays a role in the pathogenesis of kidney disease in edentulous patients^{15,16}.

Materials and methods

Outdoor patients with CKD attending Department of Nephrology, Bangabandhu Sheikh Mujib Medical University were considered as 1st group and CKD free individuals attending at dental outdoor of BSMMU were considered as 2nd group. Children, mentally disable and critically ill patients, patients with other systemic diseases like Diabetic Mellitus, Cardiovascular disease, Ischaemic heart disease, Peripheral arterial disease, Ischaemic stroke, Respiratory disease, Rheumatoid arthritis, Osteoporosis, Sickle cell anaemia were excluded. The time period of the study was limited to 6 months. Purposive sampling technique was followed for selection of the study participants for two groups. Total of 120 subjects (60 patients with CKD and 60 CKD free individuals in each group) were selected as study respondents. Informed consent was taken from the each respondent before collecting the data. The relevant data was collected by face-to-face interview as well as clinical examination with a pretested semi-structured check list according to Community Periodontal Index of Treatment Needs (CPITN) which was introduced

by WHO / FDI in 1982 and oral cavity was examined clinically to evaluate periodontal condition.

Community Periodontal Index of Treatment Needs (CPITN) used for periodontitis measurement and CPI was introduced by WHO / FDI in 1982¹³.

CPI Score	Criteria	Periodontal status
0	No periodontal disease	Normal Periodontium
1	Calculus with plaque seen or felt by probing but not bleeding on probing	Normal Periodontium
2	1-2 mm gingival crevice depth and not bleeding on probing	Normal Periodontium
3	Pathological pocket depth 3- 4 mm and bleeding on probing	Gingivitis
4	Pathological pocket more than 4 mm	Periodontitis

The collected data was analyzed by Statistical Package for Social Sciences (SPSS) software (version 21) for Windows. Cross tabulation analysis was applied to compare periodontal status between CKD and CKD free individuals, pearson chi-square test was used when P-value less than 0.05 considered as statistically significant.

RESULTS

A total of 120 study subjects were selected out of which 60 (50%) were the CKD patients and 60 (50%) were the non-CKD subjects. Table 1 denotes that, healthy periodontium, gingivitis and periodontitis were used as indicators of periodontal status of the respondents and it was found that CKD patients had suffering of periodontitis and gingivitis 37% and 28% respectively. On contrast, non-CKD subjects were with periodontitis as well as gingivitis 5% and 32% respectively.

As shown in Table 2, statistically significant difference was observed between CKD and Non-CKD groups regarding periodontitis (p-value = .02).

DISCUSSION

From the evidence presented above, it is clear that the presence of periodontitis and chronic inflammation in renal patients is associated with cause-effect relationships between periodontitis, renal disease³. In this present study, the aim of study was to assess and compare the periodontitis in between patients with Chronic Kidney Disease and non-

CKD patients. Moreover, our study parameters were normal periodontium, gingivitis and periodontitis. present study reveals that 37% of CKD patients had suffering of periodontitis. On contrast, only 5% of non-CKD subjects were with periodontitis problems and statistical significant differences were observed between CKD and Non-CKD groups regarding periodontitis.

The result is similar with the Fisher *et al* study, they used tests for mediation and structural equation models to examine more complex direct and indirect effects of periodontal disease on CKD, and vice versa. In their models, periodontal disease (adjusted odds ratio 1.62), edentulism (adjusted odds ratio 1.83), and the periodontal disease score were associated with CKD when simultaneously adjusting for 14 other factors and they demonstrated a bidirectional relationship between periodontal disease and CKD meaning each being a risk factor for the other⁹.

Furthermore, in 2013 Wahid *et al* indicates that Periodontitis increases systemic inflammatory burden leading to worsening of CKD which in turn has been found to negatively affect CKD of patients on hemodialysis therapy by altering their serum albumin and C-reactive protein levels. As hypoalbuminemia leads to increased mortality in CKD patients, it needs to be avoided by reducing systemic inflammatory burden in patients receiving HD therapy. Treating periodontal disease could be one factor that might decrease the systemic inflammatory burden and thereby improve quality of life of these patients¹⁷. This previous study finding was in consistence with the present study.

A proposed mechanism for the effect of periodontitis on the development of kidney disease is systemic inflammation. Periodontal pathogens have been shown to have the ability to adhere to, invade, and proliferate in coronary endothelial cells leading to atheroma formation and impaired vasculature relaxation. CKD share many risk factors, so it can be assumed that periodontal disease exerts similar effects within the vasculature of the kidney⁹. Both periodontitis and kidney diseases are associated with inflammatory markers such as C-reactive protein and chronic low level inflammation associated with periodontitis may lead to endothelial dysfunction which plays a role in the pathogenesis of kidney disease in edentulous patients^{7,8}. The deleterious effects of systemic inflammation on kidney function could occur during the period of active periodontal infection and accumulate during the life time of the individual. Inflammation is an important predictor of low serum albumin levels among dialysis patients⁶.

Regarding the serum markers of inflammation in HD patients, serum markers related to periodontitis that has been studied including albumin and CRP. Researchers have reported that hemodialysis (HD) patients have elevated levels of C-reactive protein (CRP) as compared to normal conditions and periodontal disease is associated with an elevation of serum levels of CRP⁹. CRP is a vague indicator of inflammation which is raised in various infections, workers of industrial zone and some other conditions. It cannot be taken as specific indicator of inflammation in CKD patients on HD therapy as it may be raised due to some other condition rather than CKD. However, albumin level is a specific indicator of prognosis of CKD and quality of hemodialysis^{9,10}.

Joseph *et al.* studied 77 patients with chronic kidney disease (CKD) for oral hygiene status, gingival inflammation, probing pocket depth, and clinical attachment loss. The subjects were grouped into three categories (no/mild, moderate, and severe periodontitis). All periodontal parameters were significantly elevated in the case group as compared to controls¹².

In another study concluded that periodontal disease was associated with a more than two-fold higher risk of CKD that was moderately attenuated after adjustment for other traditional risk factors and quality dental care. There were no statistically significant interactions between periodontal disease and race/ethnicity, educational attainment, or poverty status. Less-than-recommended dental care was associated with periodontal disease and CKD and was increasingly prevalent among non-whites and participants with lower educational attainment and lower poverty status^{3,6}.

CONCLUSION

This study reveals that patient with CKD have statistically significant greater frequency of periodontitis than non-CKD subjects. So, this current study concluded that there is a quite consistent evidence to support the positive association between periodontitis and CKD.

RECCOMENDATION

The present study supports the hypothesis that patient with CKD has elevated risk of periodontitis compared to non-CKD subjects. This study should be done comparatively in large scale for better understanding. It is also very vital to educate the CKD patients regarding maintenance of good oral health to reduce the undue consequences. Oral healthcare needs should be a part of the training of medical professionals to update themselves regarding the main dental manifestations of patients with CKD. This will aid in bridging the gap between the nephrologists and the dental clinician to provide an effective healthcare to the CKD patients and prevent the associated complications.

CONFLICT OF INTEREST

There is no conflict of interest.

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