Original Article

PERIODONTAL HEALTH STATUS OF CHRONIC RENAL FAILURE PATIENTS IN KRISHNA DISTRICT, ANDHRA PRADESH

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Abstract: The incidence of chronic kidney disease is increasing and patients receiving renal replacement therapy including hemodialysis, or renal transplantation will comprise an enlarging segment of the dental patient population. Periodontitis has been found to contribute to systemic inflammatory burden which may have significant effects on the medical management of the end stage renal disease patients.

Aims: The aim of the study was to assess the periodontal status of patients receiving hemodialysis from Krishna District Andhra Pradesh.

Methods: A cross-sectional study of 200 subjects, 100 subjects each in dialysis, and healthy group was conducted. Periodontal examination included simplified oral hygiene index, probing depth, clinical attachment loss and periodontal screening and recording index, are evaluated in both the groups.

Results: In the present study, the periodontal parameters were elevated in the dialysis group as compared to the control group and the results were statistically significant. Investigation of the impact of duration of dialysis on the periodontal tissues of patients with CRF showed that higher levels of clinical parameters in the group of patients undergoing dialysis for more than one year but without any significant difference with group of patients on dialysis duration of less than one year.

Conclusions: The results of the present study demonstrate significant association between the prevalence of severe periodontitis in hemodialysis patients compared to healthy individuals because of the negligence of oral hygiene.

Key-words: Chronic renal failure, oral hygiene, periodontal disease

1. Introduction

In chronic renal failure (CRF) patients, the functional capacity to maintain the glomerular filteration rate is lost because of the irreversible devastation of nephrons. Although glomerulonephritis was the major fundamental cause of chronic renal failure, other etiological components like hypertension, diabetes and hereditary variables additionally assume a vital part. [1-3] The treatment of chronic renal failure incorporates the dietary changes, correction of systemic complications and dialysis or renal graft receipt. [4] Dialysis is an artificial means of removing nitrogenous and other toxic products of metabolism from the blood. Chronic dialysis therapies, such as hemodialysis (HD) and peritoneal

dialysis (PD) have proven to be successful in replacing the major functions of the kidney. [5-6]

Patients underwent dialysis are more susceptible to infections because of general debilitation, and reduced immunologic response. When compared with the general population, renal failure patients on HD maintenance therapy endure an enormously expanded rate of mortality because of atherosclerotic complications. [7,8] Persons on dialysis exhibits various dental problems which insist the importance of oral health care. The most conspicuous oral sign found in dialysis patients is pallor of the oral mucosa, along with xerostomia, breath with urea odor, and an accelerated rate of calculus formation, because of an altered serum-calcium-phosphate balance. [9,10] Galili et al [11] in their questionnaire-based survey in HD patients, they observed less dental anxiety and less concern about oral health in hemodialysis and renal transplant patients compared to controls.

Periodontal diseases are inflammatory diseases that affect the supporting tissues of the teeth caused by plaque accumulation, ranging from gingivitis to severe periodontal destruction. It is realized that Periodontitis is associated with malnutrition and inflammation status, which in turn acts as risk factor for predicting morbidity and mortality in renal failure patients. [12-14] Recently several studies analyzed the evidence for an increased prevalence of periodontal disease in patients with renal disease, especially in dialysis patients. All the investigations do not strengthen the association, as some report contradictory results, [15-18] especially data regarding the periodontal health status and duration of dialysis is rare and conflicting. [17,18]

Oral health status is a potential modifiable risk factor for adverse patient-related outcomes in the treatment of renal failure and that warrants future studies. [19] Moreover, comparison of the periodontal status of dialysis patients and healthy individuals has not been depicted effectively in the literature, and also there were no reports of periodontal health status of CRF performed in Andhra Pradesh, India. On the basis of these controversial findings we aimed to analyze the periodontal health status of chronic renal failure patients on renal replacement therapy.

The specific aims of the present study were 1) To evaluate and compare the periodontal health status among hemodialysis and healthy control groups. 2) To analyze the effect of duration of dialysis on periodontal status in renal failure patients.

Subjects and Methods:

This study is a hospital based cross-sectional study, performed at Regional Dialysis Centre, Dept of nephrology, Government General Hospital, Vijayawada, Krishna District, Andhra Pradesh between Dec 2014 and Mar 2015. The study was approved by the institutional Ethical Committee of Government Dental College and Hospital, Vijayawada. The study population comprised 100 renal failure patients on hemodialysis therapy and 100 healthy controls. The CRF patients were matched with control group regarding age and gender. The control group subjects are the relatives of the CRF patients attending the dialysis unit who are systemically healthy. Inclusion criteria includes the patients in the age group of ≥ 30 years and those with stable vascular access for hemodialysis. All the patients on HD were on dialysis thrice a week on a proportional monitor with bicarbonate buffer and low-flux polysulphone membranes. In order to determine the effect of the duration of hemodialysis on clinical periodontal status, the dialysis group was further divided into two subgroups: (1) those that have been on dialysis for less than 1 year and (2) those that have been on dialysis for more than 1 year.

After explaining the study design to the participants, clinical examination was carried out which includes recording of the simplified oral hygiene index (OHI-S), periodontal screening and recording index (PSR), probing depth (PD), clinical attachment level (CAL). All clinical examinations were carried out by a single experienced dentist using the World Health Organization (WHO) periodontal probe (WHO 2002) and community

periodontal index of treatment needs (CPITN) probe to ensure consistency of measurements.

Oral hygiene status was assessed by Simplified Oral Hygiene Index of Greene and Vermillion [20] on six indexed teeth (16, upper right posterior first molar; 11, upper right central incisor; 26, upper left posterior first molar; 36, lower left posterior first molar; 31, lower left central incisor; 46, lower right posterior first molar). The periodontal status was assessed based on the periodontal screening and recording index (PSR), a WHO accepted detection system for periodontal disease by using the CPITN probe. The dentition was divided into six sextants: 17 to 14, 13 to 23, 24 to 27, 47 to 44, 43 to 33, 34 to 37. [21,22] The description of dental indices is presented in Table 1.

Periodontal examination included the parameters such as the probing depth (PD-distance between the gingiva and the bottom of the periodontal sulcus) and gingival recession (GR- distance between the gingiva and the cement-enamel junction) which were recorded at four sites per tooth (mesio-buccal, disto-buccal, mid-buccal and lingual). The clinical attachment level (CAL) was calculated as the sum of PD and GR. Maximal pocket depth (PD) was used as primary indicator for periodontitis. It was classified as: no/mild ≤3 mm, moderate 4-5 mm and severe ≥6 mm. [23]

Statistical analysis

All the data were entered into Microsoft excel program and analyzed using the statistical package for social sciences (SPSS) version 17. Mann-Whitney U-test was used to analyze the difference between the means of the two groups regarding clinical parameters. The Chi square test was used to analyze difference between the proportions of the two groups. One-way analysis of variance (ANOVA) was used to determine the difference in clinical parameters among the subgroups and logistic regression analyses were performed to explore associations. P values ≤ 0.05 were regarded as statistically significant.

Results:

Table 2 gives the details of the two groups. The two groups were closely matched for age and gender with a mean age of 55.18±6.64 in healthy group and 55.17±6.65 in dialysis group. There were 57 males and 43 females in each group.

Table 3 shows the mean values of OHI-S, PD, CAL, PSR among the two groups. There were significant differences between the healthy and dialysis groups regarding OHI-S (2.07 ± 1.16; 2.58 ± 1.49; p=0.0168), CAL (3.02 ± 1.70; 4.79 ± 2.65; p<0.05) and PD (2.28 ± 1.52; 3.39 ± 1.84; p<0.05) respectively. The mean PSR is slightly higher in dialysis group, but without any significant association between the two groups. In the dialysis group, 42% of severe periodontitis cases were observed compared to 28% in the healthy group. Comparison of the disease status among the two groups were shown in Table 4.

The effect of duration of dialysis on the clinical parameters PD, CAL, OHI-S and PSR were shown in table 5. These values were slightly higher in the subgroup of patients with duration of dialysis more than one year, but did not show any significant differences. Table 6 depicts the mean blood urea and mean serum creatinine levels in dialysis group.

TABLE 1: DETAILS OF DENTAL INDICES

ORAL HYGIENE INDEX (s) Greene and Vermillion[20]

Debris index (s):

0= No stain or debris

1= Soft debris covering≤ 1/3 surface or presence of extrinsic stain

2= Soft debris covering > 1/3 but < 2/3 tooth surface

3= Soft debris covering > 2/3 surface

Calculus index (s):

0=No calculus

1=Supragingival calculus covering≤ 1/3 exposed tooth surface

2=Supragingival calculus covering > 1/3 but < 2/3 tooth surface , flecks of subgingival calculus in

cervical margin

3= Supragingival calculus covering > 2/3 surface , Continuous band of subgingival calculus

OHI (s) = DI(S)+CI(S)

The oral hygiene status of the participants was grouped as: Good; 0-1.2, fair; 1.3-3.0 and poor; 3.1-

6.0.

PERIODONTAL SCREENING AND RECORDING INDEX: (PSR)[22]

Divided into five codes and estimates the clinical parameters of plaque, bleeding and pocket depth.

Code 0 = colored area of the probe remains visible in all the pockets of the sextant. No calculus and

no defective margins on restorations. No bleeding is evident on probing.

Code 1 = similar to Code 0, but bleeding is detected on probing.

Code 2 = calculus, above or below the marginal gingiva, is detected. Also used to indicate defective

restorative margins. Colored area of the probe is still completely visible.

Code 3 = colored area of the probe is only partly visible in at least one pocket of the sextant indicating

a PPD between 3.5 mm and 5.5 mm.

Code 4 = colored area of the probe is not visible in at least one pocket of the sextant, indicating a PPD more than 5.5 mm.

TABLE 2: Demographic details of the two groups

GROUP	MEAN AGE±SD	MEAN GENDER	
		MALE	FEMALE
DIALYSIS GROUP	55.17±6.65	57	43
HEALTHY GROUP	55.18±6.64	57	43

TABLE 3: MEAN CHANGE OF CLINICAL PARAMETERS IN TWO GROUPS

GROUP	OHI-S MEAN ±SD	PD MEAN ±SD	CAL MEAN ±SD	PSR MEAN ±SD
DIALYSIS GROUP	2.58±1.49	3.39±1.84	4.79±2.65	1.77±0.87
HEALTHY GROUP	2.07±1.16	2.28±1.52	3.02±1.70	1.57±0.70
P- VALUE	O.O168*	0.00001*	0.00001*	0.0947
t- VALUE		-4.6586	-5.6533	
Z-VALUE	-2.3921			-1.6713

P<0.05 LEVEL CONSIDERED SIGNIFICANT, SD=STANDARD DEVIATION

TABLE 4 : DISEASE STATUS IN TWO GROUPS

Disease status	Healthy group	Dialysis group	Total
No/Mild	50	40	90
Moderate	22	18	40
Severe	28	42	70
Total	100	100	200

TABLE 5 : ASSOCIATION OF CLINICAL PARAMETERS WITH DURATION OF DIALYSIS

DIALYSIS GROUP	OHI-S MEAN ±SD	PD MEAN ±SD	CAL MEAN ±SD	PSR MEAN ±SD
<1 YR	2.23±1.29	3.08±1.80	4.39±2.58	1.64±0.86
>1 YR	2.82±1.58	3.60±1.85	5.08±2.67	1.86±0.88
P- VALUE	O.O618	0.1664	0.2013	0.2148
t- VALUE		-1.3941	-1.2865	
Z-VALUE	-1.8677			-1.2405

P<0.05 LEVEL CONSIDERED SIGNIFICANT, SD=STANDARD DEVIATION

TABLE 6: MEAN BLOOD UREA AND SERUM CREATININE LEVELS IN DIALYSIS GROUP

DIALYSIS GROUP	MEAN BLOOD UREA LEVELS	MEAN SERUM CREATININE
<1 YR	148.20±32.63	7.71±1.34
>1 YR	150.59±33.75	7.87±1.24
P- VALUE	O.7240	0.5298
t- VALUE	-0.3542	-0.6306

P<0.05 LEVEL CONSIDERED SIGNIFICANT, SD=STANDARD DEVIATION

Discussion:

In spite of the fact that all CRF patients on HD maintenance therapy are potential renal transplant candidates, possible contribution of periodontitis to the inflammatory burden in the CRF population appears important to assess and maintain the periodontal health of these population. [24] This study was conducted among 200 study subjects, 100 for dialysis group and 100 for healthy control group. The dialysis group was matched with the control group in age and gender. The relatives of the patients receiving dialysis formed the control group and this is helpful for controlling some of the risk factors for periodontal disease. [25,26] The dialysis group was further divided into two subgroups (<1 year and > 1 year) based on the duration of dialysis to check whether the duration of he- modialysis had any effect on periodontal health.

In the present study, the periodontal parameters OHI-S, PD and CAL were elevated in the dialysis group as compared to the control group and the results were statistically significant. The mean OHI-S was significantly higher in dialysis group (2.58±1.49) compared to healthy group (2.07±1.16) which demonstrates the poor oral hygiene mainte-nance in dialysis group. The outcome was in accordance with the past studies. [5,27] The reason may be because of the oral negligence and inadequate compliance of the dialysis patients towards their oral health and dental treatments due to their systemic health status and self-depression by spending long time in dialysis centers. [11,17,28]

The mean PSR values were also slightly higher in the dialysis group, but without any significant association between the two groups. The periodontal destruction as indicated by elevated PD and CAL levels is significantly worse in the dialysis group (3.39 ± 1.84 and 4.79±2.65) as compared to the healthy controls (2.28±1.52 and 3.02±1.70). The prevalence of severe periodontitis in the dialysis group (48%) is high as compared to that in controls (28%). Markaoglu I et al, [29] Sobardo Marinho JS et al, [30] Davidovich et al [25] and Chen LP et al. [12] also demonstrated the increased periodontal destruction in hemodialysis patients, whereas studies of Castillo A et al [31] and Bots CP et al [5] observed no significant associa- tion of periodontal disease severity in chronic renal failure patients. Most prominently, patients on HD are in a state of CRF resulting in the uremic syndrome and this has been associated with immune dysfunction, including defects in lymphocyte and monocyte function.[32,33] CRF and renal replacement therapy can affect oral tissues and can greatly influence the dental management of the renal patient.[8] Recent studies suggest that chronic adult periodontitis can contribute to overall systemic inflammatory burden and may, therefore, have consequences in the management of the CRF patient on HD mainte-nance therapy.[34,35]

Investigation of the impact of duration of dialysis on the periodontal tissues of pa-tients with CRF showed that higher levels of clinical parameters were observed in the subgroup of patients undergoing dialysis for more than one year but without any signifi-cant difference with group of patients on dialysis duration of less than one year. This demonstrates the worsening of oral hygiene status with increase in the duration of dialysis as reported by Bayraktar G et al[34] and Davidovich E et al.[25] These results supports the suggestion that increased dialysis vintage period results in altered cellular immunity to-gether with malnutrition and uremic state resulting from protein restricted diet leads to immunodeficient state in CRF patients.[5,24,29] Increased dialysis vintage maintenance ther-apy should be associated with increased gingival inflammation and periodontitis inci-dence and severity.[12,25]

The limitations of this study include relatively small sample size. The present study demonstrated the poor periodontal status in hemodialysis patients. However, it is still premature to draw the definitive conclusions and an appropriate case control study should be designed to answer the question of whether CRF is associated with periodonti-tis or not.

Conclusion:

The results of the present study demonstrate significant association between the prevalence of severe periodontitis in hemodialysis patients compared to healthy individuals because of the negligence of oral hygiene. Regardless of the poorly understood relationships between periodontitis and renal disease, it is essential to expand our research to prevent, diagnose, and treat periodontal disease. Periodontal treatment may reduce the inflammatory burden in this population and it may also decrease the oral discomfort and improve nutritional status. A larger series of patients and longitudinal studies are needed to confirm our findings and validate the hypothesis.

Conflicts of Interest: NIL **Acknowledgements**: NIL

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