

# Prevalence of Periodontitis in Patients with End Stage Renal Disease on Maintenance Hemodialysis - A Cross Sectional Study

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## ABSTRACT

**Introduction:** Periodontal disease is a chronic inflammatory condition of multifactorial origin. The inflammatory mediators released during the progression of disease may affect all the organs of the body. Oral infection, particularly those associated with destructive periodontal disease in the general population have been associated with both an increased prevalence of atherosclerotic complications as well as an elevation in serum C-reactive protein (CRP) levels. CRP is the major acute phase protein has been found to predict all-cause and cardiovascular mortality in ESRD patients. Hence the study was undertaken to evaluate the prevalence and association of periodontitis with increased systemic inflammation reflected by CRP values, in patients with ESRD on maintenance haemodialysis.

**Material and methods:** A total no. of 100 patients of age group of 35-55 years were divided into Group A systemically healthy individuals and Group B patients with ESRD on maintenance haemodialysis in the study. Periodontal examination of both the groups was carried out by a single examiner which included plaque index (PI) gingival index, probing depths (PD) and clinical attachment loss (CAL). Based on their probing depths and clinical attachment level, patients were classified into severe, moderate, mild or no periodontitis group. Serum CRP levels of both the groups were evaluated.

**Results:** It was found that both the groups (Group A and Group B) differed significantly in PI, GI, periodontal disease status and serum CRP values, all these variables being higher in group A.

**Conclusion:** The results of the present study indicated that there is high prevalence of periodontal disease in patients with end ESRD when compared with systemically healthy individuals and serum CRP values were higher in ESRD patients with periodontitis.

**Keywords:** End Stage Renal Disease, C- Reactive Protein, Periodontitis, Chronic Renal Disease

systemic inflammation reflected by CRP values, in patients with ESRD on maintenance haemodialysis. Periodontal disease was reported as a nontraditional risk factor<sup>3</sup>. Epidemiological data also support an association between periodontitis and CKD<sup>4</sup>

## MATERIAL AND METHODS

The study was a cross sectional analytical study. A total no. of 100 patients of two groups (both male and female), within the age group of 35-55 years were included in the study with informed consent. Among them 50 patients with ESRD on maintenance haemodialysis attending the outpatient clinic at the Department of Nephrology, Osmania Medical College, Hyderabad were included in Group A (cases). The other 50 systemically healthy patients attending the Department of Periodontics, GDC and H, Hyderabad were included in Group B (controls). All the subjects underwent a complete periodontal examination by a single examiner and their CRP values were evaluated. Patients, both male and female of age groups of 35-55 years who were with ESRD on maintenance haemodialysis were included in Group A (cases) and who were without any systemic disease were included in Group B (controls).<sup>5</sup> Patients who were smokers, edentulous, receiving periodontal therapy or long term systemic antibiotic therapy were excluded from the study<sup>6</sup>

### Clinical parameters

After selection of subjects, a detailed case history was taken along with information on Age, Gender and Body weight (Kg). Clinical parameters Probing Pocket Depth (PPD), Clinical Attachment Level (CAL), Plaque Index (PI), Gingival Index (GI) and Serum CRP values were recorded:

**Probing pocket depth (PPD)<sup>7</sup>:** The depth of the periodontal pocket was measured using UNC- 15 probe held parallel to the vertical axis of the tooth, to the nearest whole millimeter from gingival margin to the base of the pocket in all six sites of tooth.

**Clinical attachment level (CAL)<sup>7</sup>:** The level of attachment was measured from cement enamel junction (CEJ) to base of

## INTRODUCTION

Periodontal diseases comprises of a group of inflammatory diseases of multifactorial etiology, affecting the supporting tissues of the teeth resulting from a complex interplay between specific gram negative microorganisms, their byproducts and the host-tissue response<sup>1</sup>. At the beginning of twentieth century, periodontitis, caries, poor oral hygiene were considered as the primary cause of systemic illness. Hence the Focal infection theory became popular which was proposed by William Hunter. It implies that, there was a nidus of infection somewhere in the body, such as periodontitis which could affect distant sites and organs via blood stream. The new look at emerging science suggests that periodontitis is a possible risk factor for several systemic diseases, including cardiovascular disease, adverse pregnancy outcomes, diabetes mellitus, bacterial pneumonia and chronic kidney disease<sup>2</sup>. In this study, investigation was carried out to evaluate whether periodontitis is associated with increased

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pocket or sulcus.

Based on probing depth and clinical attachment level, all the subjects were categorized into three groups using the criteria proposed by Joint Working Group of the Centre for Disease and Prevention in collaboration with the American Academy of Periodontology<sup>8</sup>.

Severe Periodontitis	>=2 interproximal sites with CAL>6mm	>= 1 interproximal site with probing depth >=5mm
Moderate periodontitis	>=2 interproximal sites with CAL>4mm (OR)	>= 1 interproximal site with probing depth >=5mm
Mild or no Periodontitis	Neither moderate nor severe	

**Plaque index (PI) (Silness and Loe 1964)<sup>9</sup>:** Recordings for plaque were made for all the teeth on four surfaces according to the criteria for the PI.

**Gingival index (GI) (Loe and Silness 1963)<sup>9</sup>:** Recordings for gingival status was made for all the teeth on four surfaces according to the criteria for the GI (Loe and Silness 1963).

**C-reactive protein (normal and elevated)<sup>10</sup>:** CRP was considered acceptable (normal) for haemodialysis patients if serum CRP level was ≤ 6 mg/l and elevated if CRP level was > 6mg/l.

**STATISTICAL ANALYSIS**

The results of the study were subjected to ANOVA and Paired t test for statistical analysis by using SPSS 22.0 version statistical software.

**RESULTS**

A total number of 100 patients including both male and female of age group 35-55 years were selected for the study. The total 100 patients were classified into two groups-

Clinical Parameters	Group A	Group B	Z Value	P Value
Mild periodontitis	4	6	2.81	0.005
Moderate periodontitis	12	11		
Severe periodontitis	28	15		
Total	44	32		

Statistically highly significant, P<0.01

**Table-1:** Comparison of Periodontal status between Group A and Group B

Clinical Parameters	Group A	Group B	Z Value	P Value
Mild Periodontitis	4	6	0.667	0.503
Moderate Periodontitis	12	11	0.238	0.810
Severe Periodontitis	28	15	2.626	0.009

**Table-2:** Comparison of Severity of Periodontal status between the Group A and Group B

CRP >6 mg/l	Group A Total=15				Group B Total=6				Z Value	P value
	S	M	Mi	N	S	M	Mi	N		
	11	2	2	0	3	0	2	1	2.2096	0.0271

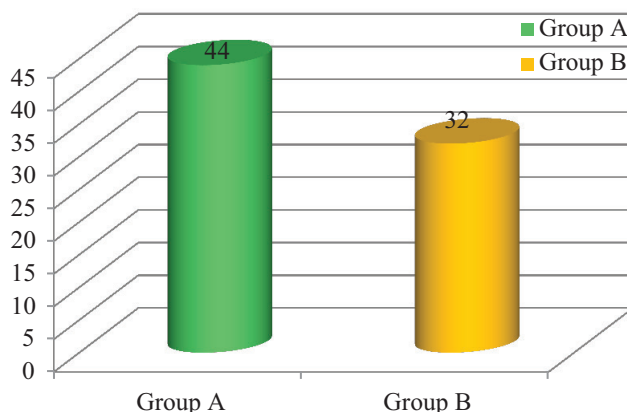
**Table-3:** Comparison of CRP (mg/l) levels between Group A and group B

Group A = Cases (n=50) – Patients who were diagnosed with End Stage Renal Disease (ESRD).

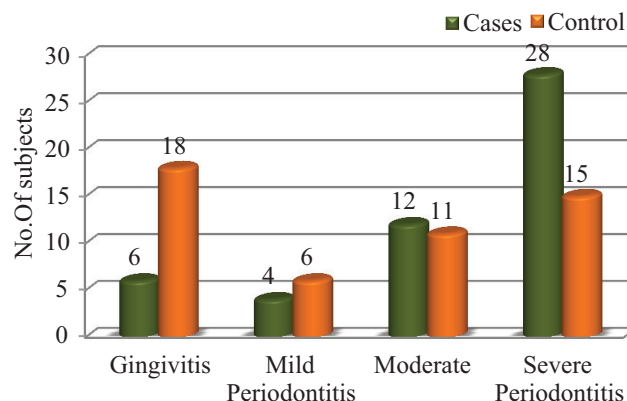
Group B = Controls (n=50) – Patients without any systemic disease.

The parameters are Age, Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Clinical Attachment Level (CAL) and serum C-Reactive Protein (CRP) levels were recorded in both the Groups A and B. The results obtained through statistical analysis were presented in the following tables.

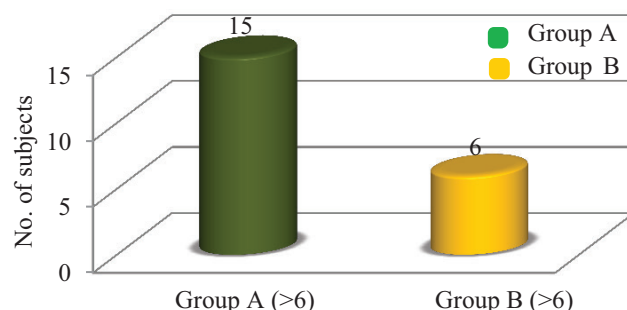
**Age:** The mean age of patients in Group A was 43.16 with standard deviation 8.46 (43.16±8.46). The mean age of patients



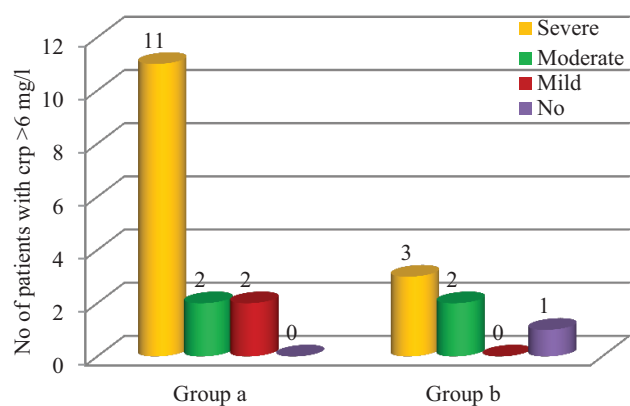
**Graph-1:** Comparison of Periodontal status between Group A and Group B



**Graph-2:** Comparison of severity of periodontal status between Group A and Group B



**Graph-3:** comparison of CRP levels between Group A and Group B



**Graph-4:** Comparison of CRP levels of different forms of periodontitis between Group A and Group B

in Group B was 42.62 with standard deviation 5.68 ( $42.62 \pm 5.68$ ). On comparison of mean age between Group A and Group B, the P value ( $P=0.70$ ) was found to be statistically non-significant.

**Plaque Index:** The mean Plaque Index score in Group A was 1.65 with standard deviation 0.52 ( $1.65 \pm 0.52$ ). The mean Plaque Index score in Group B was 1.35 with standard deviation 0.54 ( $1.35 \pm 0.54$ ). On comparison of Plaque Index between Group A and Group B, the P value ( $P=0.005$ ) was found to be statistically highly significant.

**Gingival Index:** The mean Gingival Index score in Group A was 1.92 with standard deviation ( $1.92 \pm 0.51$ ). The mean Gingival Index score in Group B was 1.26 with standard deviation 0.58 ( $1.26 \pm 0.58$ ). On comparison of mean Gingival Index between Group A and Group B, the P value ( $P=0.001$ ) was found to be statistically highly significant.

**Periodontal status:** Table 1 and Graph 1 show among 50 patients in Group A, total number of Periodontitis patients were found to be forty four. Among 50 patients in Group B, total number of Periodontitis patients found to be thirty two. On comparison between Group A and Group B, the P value ( $P=0.005$ ) was found to be statistically highly significant.

#### Severity of Periodontal disease status

Table 2 and Graph 2 shows-

**Mild periodontitis:** Among 50 patients in Group A, the total number of patients with mild periodontitis were found to be four. Among 50 patients in Group B, the total number of subjects with mild periodontitis was found to be six. On comparison of mild periodontitis between Group A and Group B, the P value ( $P=0.50$ ) was found to be statistically non-significant.

**Moderate periodontitis:** Among 50 patients in Group A, the total number of patients with moderate periodontitis were found to be twelve. Among 50 patients in Group B, the total number of subjects with moderate periodontitis was found to be eleven. On comparison of moderate periodontitis between Group A and Group B, the P value ( $P=0.81$ ) was found to be statistically non-significant.

**Severe periodontitis:** Among 50 patients in Group A, the total number of patients with severe periodontitis were found to be twenty eight. Among 50 patients in Group B, the total numbers of subjects with severe periodontitis were found to be fifteen. On comparison of severe periodontitis between Group A and

Group B, the P value ( $P=0.009$ ) was found to be statistically highly significant.

**CRP levels:** Table 3 and Graph 3 and 4 shows among 50 patients in Group A, total number of patients with CRP levels greater than 6mg/dl were found to be fifteen. Among 50 patients in Group B, total numbers of subjects with CRP level greater than 6 mg/dl were found to be six. On comparison between Group A and Group B, the P value ( $P=0.027$ ) was found to be statistically significant. Out of 15 patients in Group A, 11 were severe periodontitis patients, 2 were with moderate periodontitis and remaining 2 were mild periodontitis patients. Out of 6 patients in Group B, 3 were severe periodontitis patients, 2 were mild periodontitis patients and remaining one patient was without periodontitis.

## DISCUSSION

Assessing the prevalence and association between ESRD and periodontal disease is of significant health importance, as a causal association could imply that improved management of periodontal disease could reduce the risk in this population<sup>11</sup>

The mean age was compared between Group A and Group B. The result was found to be statistically non-significant. This explains that the age distribution in between the groups was similar.

The Plaque Index and Gingival Index scores differed between Group A and Group B with higher scores among the Group A which was statistically significant (PI,  $P=0.005$  and GI,  $P=0.001$ ). The result obtained in this study correlated with the studies conducted by Borawski et al<sup>9</sup>, Parker et al<sup>5</sup> and Jenabian et al<sup>7</sup> who reported more of plaque and bleeding scores in haemodialysis group when compared to controls. This may be because patients ESRD 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<sup>9,12,13</sup>.

The study also showed that the number of patients diagnosed with periodontitis were more in Group A ( $n=44$ ) when compared to Group B ( $n=32$ ) and the result was found to be statistically significant ( $P=0.005$ ). The number of patients with mild periodontitis were more in Group B ( $n=6$ ) when compared to Group A ( $n=4$ ) and the result was found to be statistically non-significant ( $P=0.503$ ). The number of patients with moderate periodontitis were more in Group A ( $n=12$ ) when compared to Group B ( $n=11$ ) and the result was found to be statistically non-significant ( $P=0.810$ ). The number of patients with severe periodontitis were found to be more in Group A ( $n=28$ ) when compared to Group B ( $n=15$ ) and the result was found to be statistically significant ( $P=0.009$ ). The present study is in accordance with studies conducted by Ioannidou E and Swede H<sup>14</sup>. The results were also in accordance with study conducted by Parkar SM and Ajithkrishnan CG<sup>5</sup> who showed there was a high severity of periodontitis in dialysis group when compared to controls. This could be explained that, these patients are 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 decreased host response to the subgingival gram-negative microbial challenge resulting in gingival inflammation and periodontitis. Other contributory factors are the presence of confounding

diseases like diabetes mellitus, as there is high incidence of diabetes in ESRD population and the evidence of strong relationship between diabetes mellitus and periodontal disease in general population as reported by Grossi et al. in 1994<sup>15</sup>, and also poor oral hygiene<sup>9,13</sup>.

In the present study, subjects with CRP values >6 mg/l were more in Group A (n=15) when compared to Group B (n=6) and the result was found to be statistically significant (P=0.027). Out of 15 patients with CRP levels >6 mg/l in Group A, 11 patients were with severe periodontitis (n=11) indicating high inflammatory risk in this population. Two patients were moderate periodontitis and two were with mild periodontitis. In Group B, out of six, 3 patients were severe periodontitis, two patients with mild periodontitis and one patient was without periodontitis. This in accordance with studies conducted by Rahmati et al<sup>16</sup>, Kadiroglu AK et al<sup>17</sup>, Ioannidou E and Swede H<sup>18</sup> who showed higher CRP values in haemodialysis group when compared to healthy controls. This may be because of periodontitis and/or other confounding factors which increase CRP values like old age, obesity, diabetes duration, hypertension, smoking, and other inflammatory conditions. There is evidence supporting increased CRP values in periodontitis subjects when compared to subjects without periodontitis according to studies conducted by Yamazaki et al<sup>19</sup> and Salzberg et al<sup>20</sup>.

Studies conducted by Aiuto et al<sup>21</sup> and Seinost et al<sup>22</sup> showed periodontal treatment resulted in a statistically significant decrease in plasma CRP values. Lee et al<sup>23</sup> conducted a study in periodontitis patients concluded that patients with periodontal disease who underwent subgingival curettage or periodontal flap have a remarkably decreased risk of ESRD.

The results of the present study highlights, the prevalence and severity of periodontal disease was found to be higher in subjects with ESRD compared to controls which was demonstrated by increased scores of PI, GI, and severity of periodontal disease. Patients with CRP values >6 mg/l were found to be more in Group A when compared to Group B. A statistically significant positive association was found between the Group A and Group B parameters.

## CONCLUSION

The study is one such attempt to find out the prevalence and association of periodontitis in ESRD on maintenance hemodialysis with increased systemic inflammation reflected by CRP values. It can be concluded from this study that the severe periodontitis, moderate periodontitis and increased CRP level (>6mg/ml) patients were more in group A subjects than group B. Hence this study suggests that periodontitis may be an overlooked source of inflammation in ESRD patients, Therefore, dentist could play a key role in maintaining the CRP levels of end stage renal disease patients within acceptable limits by providing them with periodontal therapy, thus improving their quality of life because increased levels of CRP predict all-cause and cardiovascular mortality in these patients.

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