**ABSTRACT**

**Introduction:** Periodontitis is a chronic inflammation of the supporting structures of the teeth. It has been shown to be associated with systemic diseases including cardiovascular and respiratory diseases, diabetes mellitus and preterm birth. Conflicting reports on the relationship of chronic renal failure patients and periodontal diseases are present in literature. No previous study has been reported in renal patients in Nepalese population. Hence this study was done to assess the oral hygiene and periodontal conditions in hemodialysis patients in a Tertiary level hospital in Nepal.

**Methods:** Descriptive observational study in which hemodialysis cases were assessed for periodontal parameters including Oral Hygiene- Simplified Index (OHI-S), Plaque Index (PI), Gingival Index (GI), Probing pocket depth (PPD) and clinical attachment level (CAL).

**Results:** A total of 30 patients (20 male, 10 female; mean age 51.06±14.37 years) were assessed. Mean OHI-S, PI, GI, PPD and CAL were 4.02±0.89, 1.93±0.27, 1.57±0.28, 2.09±0.19 and 2.18±0.42, respectively. The distribution of periodontitis was 10% severe, 46.66% moderate and 43.33% mild periodontitis.

**Conclusions:** Hemodialysis patients showed poor oral hygiene and moderate and periodontitis. Hence periodic assessment and periodontal treatment may prevent further complications in these patients.

**Keywords:** chronic renal failure; gingivitis; hemodialysis; oral hygiene; periodontitis

**INTRODUCTION**

Chronic renal failure is a condition associated with abnormal kidney function and a progressive decline in glomerular filtration rate that necessitates treatment with renal transplantation or hemodialysis. Common etiology includes diabetes mellitus, hypertension, glomerulonephritis, polycystic kidney disease and pyelonephritis. Mortality rates in dialysis patients is 18-20% per year, mainly due to cardiovascular diseases (50%) and infections (15%).

Periodontal disease is a chronic inflammatory condition broadly classified as gingivitis and periodontitis with the extension of the inflammation into the supporting structures of the teeth leading to destruction of periodontal ligament and alveolar bone and eventual tooth loss.

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The role of periodontal disease in systemic conditions including cardiovascular diseases and diabetes mellitus is well known but the exact role of periodontal disease in renal disease is not clear. Periodontal disease has been found to be moderate to severe in renal failure patients but there are few contradictory findings. Chronic inflammation like periodontitis in cardiovascular diseases may aggravate the renal condition of the patients. Hence, there may be a direct or indirect role of periodontal disease in renal patients. This is the first known study done in Nepal to assess the periodontal status in dialysis cases.

**METHODS**

Patients referred to Hemodialysis Center of our hospital for dialysis for chronic kidney failure (CKD) from May 1- June 1 2016 were enrolled to investigate their periodontal status. The participants’ age, gender, dialysis duration and systemic disease were recorded. All patients had been treated with hemodialysis for at least 3 months.

The exclusion criteria included young patients below 19 years, dentition with <20 teeth present, diabetes mellitus, malignancies, current smokers, clinically evident infectious diseases, surgery and antibiotics in preceding 6 months. In total, 30 out of 42 hemodialysis patients (20 male, 10 female) with mean age 51.06 ±14.37 fulfilled the inclusion criteria, out of which 13 patients had (6 moderate & 7 mild) hypertension. Signed informed consent was obtained from all the patients.

The oral and dental examination was carried out by a single trained examiner using mouth mirror, explorer and UNC-15 probe. Four parameters were assessed including oral hygiene Index-Simplified, OHI-S (Green and Vermilion) in which 16, 11, 26, 36, 13, 46 were examined. In the case of missing teeth, the adjacent teeth were examined. For Silness and Loe plaque index (PI), Loe and Silness gingival index (GI), Probing Pocket Depth (PPD) and Clinical Attachment level (CAL), all teeth were examined from four sided (buccal, mesial, distal, lingual/palatal). Gingival index is a measure of the gingival inflammation. PPD was taken as the distance from the gingival margin to the base of the gingival sulcus/periodontal pocket. Gingival recession was measured as the distance from the cemento-enamel junction to the gingival margin. These scores were then added up to indirectly obtain the values for CAL.

All the subjects were categorized into three groups (Mild/No Periodontitis, Moderate Periodontitis and Severe Periodontitis) based on CAL and PPD, using the criteria proposed by the joint working group of the Centre for Disease Control and Prevention in collaboration with the American Academy of Periodontology in 2003 (Table 1).

<table>
<thead>
<tr>
<th>Category</th>
<th>Clinical Attachment Level (CAL)</th>
<th>Probing Pocket Depth (PD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Severe Periodontitis</strong></td>
<td>≥2 interproximal sites with CAL ≥ 6mm (not on same tooth) and</td>
<td>≥1 interproximal sites with PD ≥ 5mm</td>
</tr>
<tr>
<td><strong>Moderate Periodontitis</strong></td>
<td>≥2 interproximal sites with CAL ≥ 4mm (not on same tooth) or</td>
<td>≥2 interproximal sites with PD ≥ 5mm</td>
</tr>
<tr>
<td><strong>No or Mild Periodontitis</strong></td>
<td>Neither “moderate” nor “severe” periodontitis</td>
<td></td>
</tr>
</tbody>
</table>
RESULTS

Nearly all patients showed a generalized pallor of the oral mucosa (Fig.1). Only two patients showed mild gingival enlargement in anterior teeth.

The patients showed high OHI-S indicating poor oral hygiene with high calculus formation. The plaque index score was fair and gingival index score indicated moderate gingivitis with low levels of overall PPD and CAL. However following the CDC guideline, the active disease was calculated based on Table 1 and periodontitis was seen in all cases with 46.6% showing moderate periodontitis (Table 3).

DISCUSSION

The present study assessed the periodontal status of the hemodialysis patients in Nepalese population due to lack of adequate knowledge in this issue. Hemodialysis patients showed high OHI-S which signifies poor oral hygiene and moderate increase in PI and GI. Other studies10-11,17-18 have reported that high levels of OHI-S and PI levels. Oshrain et al.14 reported PI and PPD increased significantly with age, but the increase found in GI and CAL was not significant. Craig et al.19 stated that mere prevalence of quiescent form of periodontal disease is not clinically as significant as active progressive disease that can impair the inflammatory state in the body. Hence case definitions proposed by CDC Working Group (Table1) was followed and this showed almost all patients had some form of periodontitis with active disease in localized areas.

Various other studies6,10-11,18,20 have reported a greater prevalence of periodontal disease in renal patients. However, contradictory findings13-14,21-22 have also been reported. OHI-S was high in this study possibly due to high Calculus component of OHI-S. Davidovich et al18 stated that the uremic condition was positively correlated with the increase in periodontal parameters. Al Wahadni and Al Omari23 stated that hemodialysis patients might ignore oral hygiene behaviors or other health-related potential problems due to spending long time in the dialysis center. Likewise, Galili et al. 24 stated these patients neglected oral health and

Table 2: Table 2. Mean of periodontal parameters. PI:Plaque index, GI:Gingival index, PPD:Probing pocket depth, CAL: Clinical attachment level

<table>
<thead>
<tr>
<th>Periodontal parameters</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHI-S</td>
<td>4.02 ± 0.89</td>
</tr>
<tr>
<td>PI</td>
<td>1.93 ± 0.27</td>
</tr>
<tr>
<td>GI</td>
<td>1.57 ± 0.28</td>
</tr>
<tr>
<td>PPD (mm)</td>
<td>2.09 ± 0.19</td>
</tr>
<tr>
<td>CAL (mm)</td>
<td>2.18 ± 0.42</td>
</tr>
</tbody>
</table>

Table 3. Distribution of periodontal disease severity

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe Periodontitis</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Moderate Periodontitis</td>
<td>14</td>
<td>46.66</td>
</tr>
<tr>
<td>No or Mild Periodontitis</td>
<td>13</td>
<td>43.33</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>
showed poor compliance to dental treatment as they might be depressed.

The patients in this study had a shorter duration of dialysis (6 months-3 years) with most cases with treatment duration of less than a year. Torkzaban et al. did not find any relationship between dialysis duration and periodontal indices, which probably is due to the shorter average duration of dialysis (1.3 years). Jenabian et al. reported a higher incidence of periodontal disease with longer duration of dialysis.

In this study, patients had poor oral hygiene with moderate gingivitis. Bleeding on probing is an objective measure of gingivitis but in these cases generalized pallor was seen with most of them showing anemia (Hb levels 6.1-9 gm/dL). Naugle et al. reported high bleeding on probing in adolescent patients on dialysis but they did not specify the proportion of patients on peritoneal dialysis versus hemodialysis. High dose heparin in anemic patients can cause increased bleeding but patients in this study were on low dose heparin and were found to have moderate gingivitis even with poor oral hygiene. A study reported that the uremic state in the hemodialysis patients may suppress inflammatory reactions in the tissues, which would result in lower chances of detection of gingivitis. Insignificant change of GI may be due to suppression of immune system. Uremia has been reported to impair T & B-lymphocyte function but this was not found to be so in yet another study.

Periodontitis is known to be a covert source of systemic inflammation with α2 macroglobulin, α1 antitrypsin and C-reactive protein (CRP). Beck et al. stated the cardiovascular risk were 1.5, 1.9, 2.8 for bone loss, total Chronic heart disease (CHD), fatal CHD and stroke by increasing endotoxins burden and cytokines like Thromboxane α2, Interleukin-2β, PGE2, TNF-α. Grubbs et al. in NHANES US National survey found moderate and severe periodontitis were 5.3% and 10.6% and that periodontal disease had two-fold risk of Chronic kidney disease. Independent associations between poor dental health and cardiovascular disease in maintenance hemodialysis patients, and between advanced periodontitis and left ventricular hypertrophy in kidney transplant recipients have been shown.

Furthermore, there have been studies that show periodontal therapy has beneficial effect on some cardiovascular risk factors in otherwise healthy patients with periodontitis with reduction in systemic markers and cholesterol levels and in blood pressure. A three-fold decrease in CRP and ESR and a rise in Hemoglobin levels in Hemodialysis patients were reported to occur after 6 weeks of periodontal therapy which is in accordance with a review by Ariyamuthu et al. in 2013.

The limitations of the present study was that the study was done in a single centre with a small sample since adolescents, diabetics, current smokers and patients under antibiotics in previous 6 months were excluded. There may be confounding factors like anemia, stress, socioeconomic and behavioral factors. Controls were not used for this study since there is always possibility of bias in a non-blinded study. Further multi-centric longitudinal studies should be done in patients with long-term therapy. A meta-analysis by Paraskevas et al in 2008 has reported that the issue of poor oral health status in CKD patients apparently deserves a higher awareness of the problem, and increased attention, and indicates the need for a closer collaboration between primary care physicians, nephrologists and dentists.
CONCLUSION

The hemodialysis patients showed high levels of calculus formation, poor oral hygiene and moderate periodontal disease. There may be a need to assess, monitor and treat the periodontal condition of these patients to prevent further progression of periodontal disease and improve the overall health of the patient.

REFERENCES

17. Naugle K et al. The oral health status of individuals on renal dialysis. Annal


