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# Interplay between inflammatory markers and parameters of peridontitis in CKD

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**ABSTRACT**
Chronic kidney disease is associated with various systemic complications, including periodontitis, a chronic inflammatory disease that affects the supporting tissues of the teeth. Inflammatory markers have been implicated in the pathogenesis of periodontitis. However, limited research has explored the correlation between inflammatory markers and parameters of periodontitis, including pocket depth and clinical loss of attachment, in chronic kidney disease patients. Theaims of this study to find out the correlation between inflammatory markers and parameters of periodontitis in chronic kidney disease, exploring the potential mechanisms underlying this relationship and discussing the implications for clinical practice.It is a prospective study which conducted in department of medicine at Mln Medical College Prayagrajwhich included 50 chronic kidney disease patients on the basis of inclusion and exclusion criteria.Periodontal evaluation was done by measuring the pocked depth and clinical loss of attachment of gum and classify it by using CDC- AAP .Blood sample was taken for inflammatory markers and send it.After evaluation we found that 40 chronic kidney disease patient which showed periodontitis changes had significantly pocked depth in cases ( p value<0.001) but clinical loss of attachment didn't showed any relation. Inflammatory markers like serum interleukin-6,serum vitamin d,c- reactive protein and serum procalcitonin were statistically significant with pocket depth but with respect to clinical loss of attachment we found only serum vitamin d showed significant negative correlation .Hence,we concluded from our study that these marker statistically significant with respect to parameters of peridontitis.Therefore these markers can be used as follow up marker in treatment of periodontitis in ckd patients.

**Keywords**: chronic kidney disease, pocket depth, clinical loss of attachment, periodontitis, inflammatory markers.

## I. INTRODUCTION

Periodontitis is a chronic inflammatory disease that affects the supporting tissues of the teeth, including the gums, periodontal ligament, and alveolar bone. It is caused by the accumulation of dental plaque, leading to an immune response and subsequent inflammation[1]. Chronic kidney disease (CKD) is a systemic condition that affects kidney function and can have various oral manifestations, including periodontitis. In recent years, there has been growing evidence suggesting a bidirectional relationship between periodontitis and CKD, where periodontitis may contribute to the progression of CKD and vice versa[2].One of the key clinical parameters used to assess the severity of periodontitis is pocket depth (PD) and clinical loss of attachment (CAL), which reflect the extent of destruction of the periodontal tissues. PD is the measurement of the depth of the periodontal pocket, while CAL is the measurement of the distance from the cemento-enamel junction to the base of the pocket, indicating the amount of attachment loss. Inflammatory markers play a crucial role in the pathogenesis of periodontitis and may have a significant association with PD and CAL in CKD patients[3].Several studies have investigated the relationship between inflammatory markers and PD/CAL in periodontitis among CKD patients[4]. Earlier studies only studied few markers like serum crp between ckd andperidontitis and there result not very promising. Furthermore, these inflammatory markers have been shown to correlate with the severity of periodontitis and may serve as potential predictors of disease progression and treatment outcomes in CKD patients[5]. So due to insufficient literature regarding this we designed this study to correlate between serum il-6, serum procalcitonin, serum vitamin d &crp and parameters of peridontitislike pocket depth and clinical loss of attachment for progression of periodontitis in CKD patients and their treatment.

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## II. MATERIAL AND METHOD

2.1 Study design

This prospective study comprised of patients visited to nephrology department from July 2021 to June 2022 at SRN Hospital Prayagraj. All adults (age>18 years), male and female patients, were recruited after informed consent. Previously diagnosed CKD patient was evaluated and recorded. Exclusion Criteria comprised of: individual who underwent periodontal therapy, Malignancy, HIV, Hepatitis Upper respiratory tract infections, pregnant and lactating women, other systemic infection like AKI andPancreatitis.

2.2 Study procedure

Medical history and clinical Examination was taken and recorded. CKD & its stages were evaluated by eGFR and USG abdomen. Laboratory assays of serum BUN, serum creatinine and inflammatory markers like serum interleukin-6, serum vitamin d,crp and serum procalcitonin was measured and assessment of dental and periodontal status by two dentists who were blinded to CKD status. Periodontal measures were done on randomly assigned half-mouths, one upper quadrant and one lower quadrant selected at the beginning of the examination[19]. The buccal and mesial-buccal aspects of each tooth were scored separately for each periodontal measure: gingival bleeding, calculus, gingival recession, and pocket depth. Loss of attachment was derived from two measurements made at each site: (1) the distance from the free gingival margin to the cemento-enamel junction, and (2) the distance from the free gingival margin to the bottom of the sulcus (pocket depth). When the gingival margin had receded and thecemento-enamel junction was exposed, the first number was scored as a negative value and was an indication of gingival recession. The loss (level) of attachment variables was calculated by subtracting the recorded distance of the free gingivalmargin to cemento-enamel junction (1) from the recorded distance of the free gingival margin to the base of the sulcus (2). Periodontal disease was defined based on the Centers for Disease Control and prevention (CDC) criteria.

2.3 Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean and Standard deviations. Quantitative variables were compared using Mann WhitneyU test/Unpaired T test as appropriate between two groups. Qualitative variables were compared using Chi –Square test and fischer exact test as appropriate. To measure the strength of Association between two scale parameters using spearman correlation coefficient as appropriate. A P value of <0.05 was considerelystatistically significant. The data was entered in MS Excel spreadsheet and analysis was done using statistical package for Social Science version 23.0.

## III. RESULT

Out of 50 ckd patients,40 patients showed periodontitis changes considered as case and 10 did not showed any changes of periodontitis considered as control.In study population,we observed probing pocket depth and clinical loss of attachment which is illustrated below table 1.

Table 1: Distribution of probing pocket depth and clinical loss of attachment based on their groups.

| Parameters of peridontitis | Groups | | | Mann Whitney U test | |
|---|---|---|---|---|---|
| | Cases (Mean ±SD | Control (Mean ±SD) | Total (Mean ±SD) | Z value | P value |
| Pocket depth (mm) | 3.2±0.97 | 1.20±.42 | 2.80±1.20 | -4.792 | <0.001 |
| Clinical loss of attachment | 5.57±1.29 | - | 5.57±1.29 | NA | NA |

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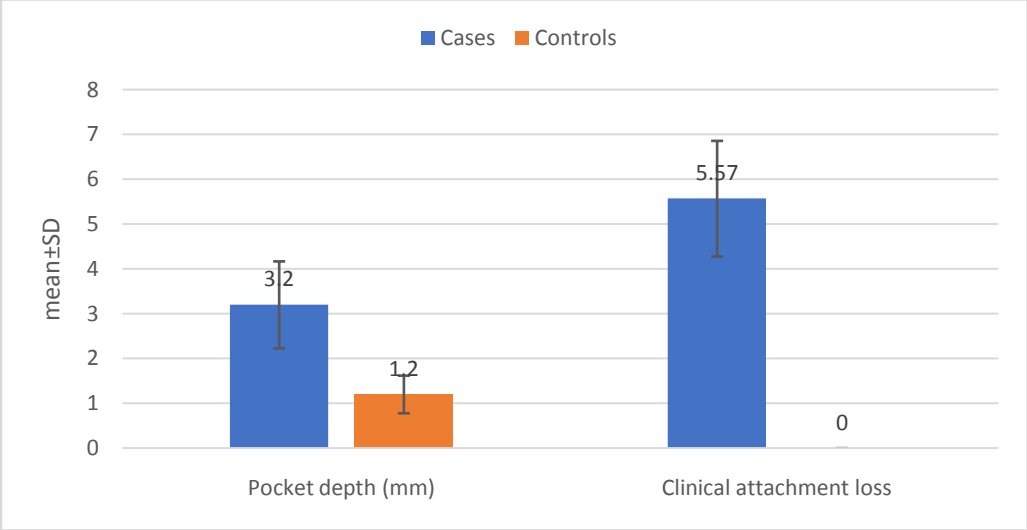


Figure 1: Bar graph showing the mean distribution of pocket depth & clinical attachment loss of teeth in cases & controls

Above table explain that mean (±SD) probing pocket depth of cases is found to be 3.20±0.97 and of control is 1.20 ±0.42. The overall mean ( ±SD) of pocket depth is found to be 2.80±1.20 which showed statistically significant difference in cases with respect to control p value<0.001). We were unable to comment on clinical loss of attachment because in control group we did not found any clinical loss of attachment in gum.Table 2 depicted below showed the correlation of inflammatory markers with probing pocket depth of study population.

Table 2: Correlation betweeninflammatory markers and PPD in study population

| Serum inflammatory markers | Cases | | Control | |
|---|---|---|---|---|
| | Spearman 'rho correlation coefficient | P value | Spearman'rho correlation coefficient | P value |
| IL-6 | 0.746 | 0.001 | 0.298 | 0.402 |
| Serum procalcitonin | 0.377 | 0.016 | 0.664 | 0.036 |
| Serum vitamin d | 0.335 | 0.034 | 0.091 | 0.803 |
| CRP | 0.317 | 0 .046 | 0.299 | 0.401 |

Table 2 explained that serum il-6 , serum procalcitonin,serum vitamin d and CRP were statistically significant with probing pocket depth of cases but in control we observed that serum pct were statistically significant which can be due to sepsis in ckdpatient and other markers were not statistically significant in control.Table 3 mentioned below showed the correlation between inflammatory markers and clinical loss of attachment in study population.

Table 3: Correlation Between Inflammatory markers and CAL

| Serum inflammatory markers | Cases | |
|---|---|---|
| | Spearman' rho correlation coefficient | P value |
| Serum il-6 | 0.196 | 0.395 |
| Serum | 0.381 | 0.088 |

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| | | |
|---|---|---|
| procalcitonin | | |
| Serum vitamin d | -0.476 | 0.029 |
| CRP | 0.295 | 0.194 |

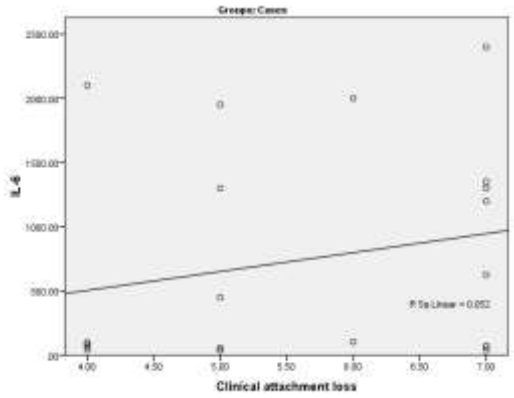


**Figure 24: Scatter plot showing the correlation between IL-6 & CAL in case population**

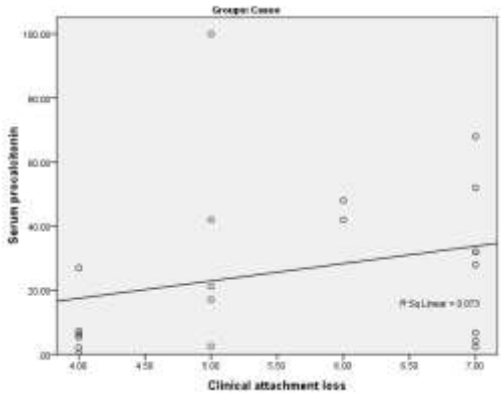


**Figure 25: Scatter plot showing the correlation between Serum procalcitonin & CAL in case population**

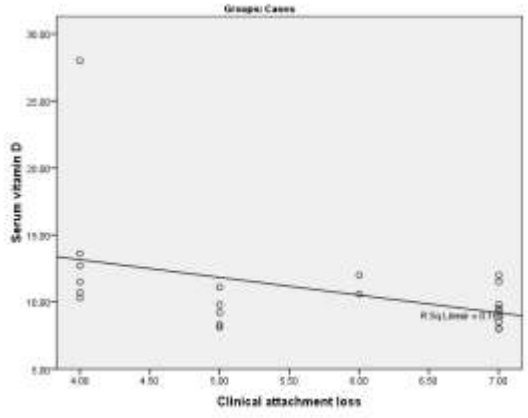


**Figure 26: Scatter plot showing the correlation between Serum vitamin D & CAL in case population**

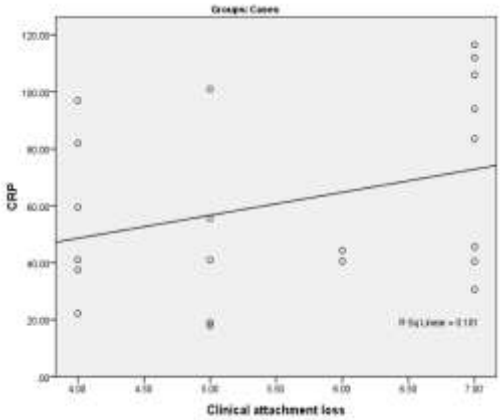


**Figure 27: Scatter plot showing the correlation between CRP & CAL in case population**

Above table 3 explained that inflammatory markers not statistically significant with CAL in cases except serum vitamin d which was statistically significant negative correlation with CAL whose p value (0.029).CAL was absent in control so we didn't comment it.

## IV. DISCUSSION

The relationship between periodontitis, which is a chronic inflammatory condition affecting the gums and supporting tissues of the teeth, and chronic kidney disease (CKD), a condition characterized by the gradual loss of kidney function, has been the subject of research interest.The aim of this study to investigate the association between various biomarkers, including serum interleukin-6 (IL-6), serum procalcitonin, serum vitamin D, and C-reactive protein (CRP), with pocket depth (PD) and clinical attachment level (CAL) in CKD patients with periodontitis. The results of the study revealed that serum IL-6, serum procalcitonin, serum vitamin D, and CRP were all statistically significant with PD in CKD patients with periodontitis. This suggests that these biomarkers may be associated with the severity of gum pocket depth in CKD patients with periodontitis. However, when it comes to CAL, only serum vitamin D showed a statistically significant association, indicating that it may be specifically related to the clinical attachment level of the gum tissue to the tooth in CKD patients with periodontitis.These findings are consistent with previous research that has shown an association between systemic inflammatory markers, such as

IL-6 and CRP, and periodontal disease (Tonetti et al., 2018; Genco et al., 2018). Additionally, the role of vitamin D in periodontal health has been well-documented, with studies suggesting that vitamin D deficiency may be associated with increased risk of periodontitis (Bokhari et al., 2018; Dietrich et al., 2005) but these studies only showed the relationship between serum biomarkers and periodontitis, they did not done the study on ckd patients. In this respect our study is unique and provided the evidence supporting the relationship between these biomarkers and periodontal disease in CKD patients.It's important to note that this study has some limitations, including its cross-sectional design, which does not establish causality, and the relatively small sample size. Additionally, other factors such as age, smoking status, and oral hygiene practices, which can influence periodontal health, were not accounted for in the analysis. Nevertheless, the findings of this study suggest that serum IL-6, serum procalcitonin, serum vitamin D, and CRP may be associated with PD, and serum vitamin D may be specifically related to CAL in CKD patients with periodontitis.

## V. CONCLUSION

Therefore Ourstudy provides evidence of the association between serum IL-6, serum procalcitonin, serum vitamin D, and CRP with PD, and serum vitamin D with CAL in CKD patients with periodontitis. These findings highlight the potential role of these biomarkers in the pathogenesis and severity of periodontal disease in CKD patients.

**Abbreviations:**
IL-6 – interleukin-6
Serum pct- serum procalcitonin
CRP-C- reactive protein
Serum vit d- serum vitamin d
PPD- probing pocket depth
PD- pocket depth
CAL-clinical loss of attachment
CKD – chronic kidney disease

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