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PERIODONTAL PATHOLOGY AND CHRONIC KIDNEY DISEASE: SYSTEMATIC REVIEW OF THE LITERATURE

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ABSTRACT

Background: Chronic Kidney Disease (CKD) contributes to elevated levels of low-grade systemic inflammation (LGSI) which is characterized by the production of inflammatory mediators such as C-reactive protein or interleukin-6. These biomarkers reflect the patient's inflammatory status. LGSI can both influence and be influenced by the development of CKD, as well as by other systemic pathologies, including Periodontal Disease (PD). This review aimed to explore the potential bidirectional relationship between chronic kidney disease and Periodontal Disease in the context of inflammatory biomarkers and to assess whether periodontal treatment can lead to improvements in systemic inflammatory status.

Material and Methods: This systematic review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. An electronic search was carried out in PubMed, Scopus, and Cochrane databases, supplemented by manual cluster searching. The review included randomized clinical trials that employed non-surgical periodontal treatment, as well as observational case-control and cross-sectional studies, published in English or Spanish within the past 10 years. The quality of the included studies was assessed using the Cochrane Risk of Bias and the Newcastle-Ottawa Scale.

Results: A total of five clinical trials, three case-control studies, and seven cross-sectional studies were included. These were summarized in tables that distinguished between patient groups, analyzed biomarkers, and assessed clinical periodontal and renal parameters. Additional information, such as sample type, sex, age, and, in the case of the clinical trials, the type of treatment administered, was also taken into account.

Conclusions: Patients affected by both CKD and PD exhibit heightened systematic inflammation. The findings suggest a relationship between the two conditions, as non-surgical periodontal treatment appears to reduce inflammatory biomarkers and lead to clinical improvements in both conditions. However, the bidirectional nature of this relationship cannot be confirmed due to insufficient evidence regarding the impact of chronic kidney disease treatment in periodontal outcomes.

Keywords: Chronic kidney disease, periodontal disease, inflammatory biomarkers, cytokines

Introduction

Chronic kidney disease (CKD) is defined by structural or functional abnormalities of the kidneys and is characterized by a persistent loss of nephron function[1] and a reduction in glomerular filtration rate (GFR) to below 60ml/min/1.73m^2 for a duration of three months or longer[2].

This entity is classified into five stages, ranging from mild (Stage 1) to severe (Stage 5). Patients who progress to stage 5, also referred to as end-stage renal disease, require hemodialysis or kidney transplantation to restore renal function. Stage 3 is the most diagnosed and is further divided into stages 3A and 3B, with stage 3A being more prevalent[3-6].

The prevalence of CKD has risen in recent years, now affecting more than 10% of the general population and over 50% of high-risk groups, making it a pressing public health concern[1,7].

Chronic kidney disease is closely associated with low-grade inflammation (LGI), a chronic inflammatory state characterized by the production of low-level inflammatory mediators[8]. These mediators contribute to the release of inflammatory biomarkers such as C-reactive protein (CRP), tumor necrosis factor-alpha (TNF -α), and interleukins such as IL-6[9]. Such biomarkers serve as indicators of the patient's inflammatory status and the presence of underlaying pathological processes[10].

Low grade inflammation may play a role in the development of CKD, and conversely, CKD may contribute to the persistence of LGI. This inflammatory state also constitutes a risk factor for various other chronic conditions, including diabetes, cardiovascular diseases, neurodegenerative disorders, cancer, and periodontal disease, all of which are classified as non-communicable chronic diseases. According to the World Health Organization (WHO), these conditions result from a combination of genetic, environmental, physiological, and behavioral factors[11].

Periodontal disease (PD) is a chronic, multifactorial inflammatory condition triggered by a dysbiotic shift of the plaque biofilm. It is characterized by the progressive destruction of the supporting dental tissues, potentially leading to tooth loss[12]. Severe forms of PD affect 10,8% of the global population, impacting an estimated 743 million individuals worldwide[13].

Periodontal disease can be classified into four stages (I-IV) based severity and complexity of management, with stage I representing the least severe form and stage IV the most advanced. Additionally, PD is graded according to the rate of progression (A, B, C): grade A indicates a slow rate, while grade C reflects rapid disease progression. Risk factors such as smoking and diabetes, along with biological variables and systemic health implications, can exacerbate and accelerate the course of the disease[14].

There is growing evidence that all non-communicable chronic diseases interact through the shared mechanism of inflammatory biomarker production. As such, a potential bidirectional relationship between CKD and PD may exist, driven by the systemic inflammatory burden present in both conditions. Cytokines produced during the active phases of PD may contribute to the progression of CKD[15,16].

Furthermore, patients with CKD frequently present oral manifestations, including radiographic evidence of reduced bone density, xerostomia, halitosis, and increased calculus accumulation. These oral alterations suggest that PD may act as an aggravating factor in the progression of morbidity of CKD[15,17].

However, the current body of literature exploring the relationship between these two diseases remains limited[16-18].

Materials and Methods

Study design

This systematic review was conducted in accordance with the PRISMA (Preferred Reporting

Items for Systematic Reviews and Meta-Analyses) guidelines[19]. A PICO (Population, Intervention, Comparison, Outcome) clinical question was developed to guide the review: In patients with both periodontal disease and chronic kidney disease (P), what is the effectiveness of periodontal treatment (I) compared to no treatment (C), in improving inflammatory biomarkers? (O).

Based on this research question, a comprehensive literature search was performed using the MEDLINE (PubMed), Scopus, and Cochrane databases. The search strategy included the following keywords: "periodontal disease", "chronic kidney disease", "cytokines" and "inflammatory biomarkers", combined using the Boolean operators "AND" and "OR". The final search algorithm applied was: (chronic kidney disease) AND (periodontal disease) AND ((cytokines) OR (inflammatory biomarkers)).

One author (Gassó, A) conducted the initial selection of articles retrieved from the database search. After removing duplicates, titles and abstracts were screened by two reviewers (Gassó, A and Omaña, C), and studies that did not align with the research question were excluded. The remaining articles were reviewed in full to determine their eligibility for inclusion in the systematic review (Figure 1).

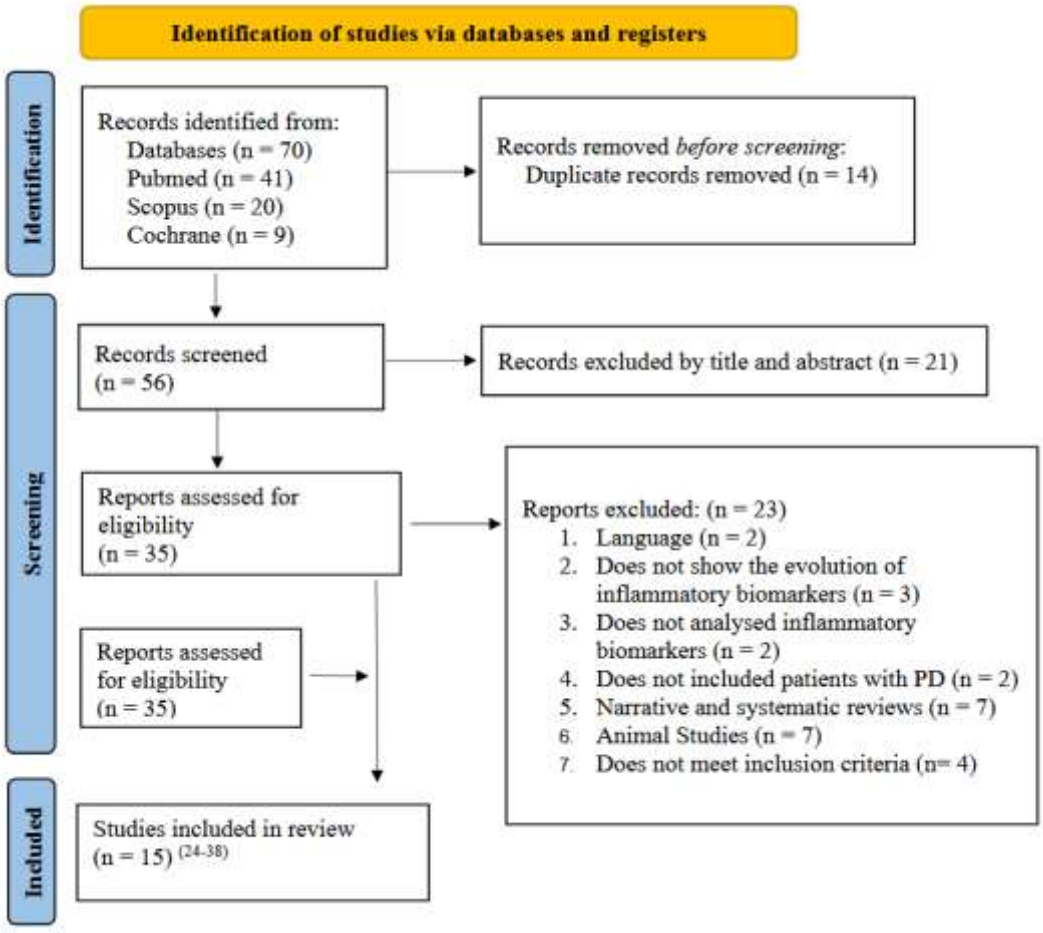

Figure 1. Selection Progress of articles according to the PRISMA flowchart.

The inclusion criteria were as follows: 1) randomized clinical trials, 2) cohort studies, 3) case-control studies, 4) cross-sectional studies, 5) published between 2013 and 2024 in English or Spanish. 6) Studies involving patients diagnosed with both PD and CKD, regardless of whether periodontal treatment was administered (depending on the study design), and 7) studies reporting the evolution of inflammatory biomarkers in each group. Exclusion criteria included: 1) narrative reviews, 2) systematic reviews, 3) prevalence studies, 4) books and documents, 5) animal studies and 6) any publications older than 10 years.

Qualitative Analysis of the Results

The selected studies were analyzed using structured tables to perform a qualitative analysis of the results, distinguishing between experimental studies, case-control studies, and cross-sectional studies. In the experimental studies, the following variables were examined: the number of patients and gender distribution, mean age or age range, allocation of patients to the experimental group (EG) and control group (CG), the stage and grade of both CKD and PD, the type of sample collected, the biomarkers analyzed, and the clinical periodontal and renal parameters assessed. A separate table documented follow-up stages, the type of periodontal treatment administered to the EG and CG, and the outcomes observed.

The same variables were recorded in case-control and cross-sectional studies, with the addition of the distribution by health status: patients with PD only, CKD only, both conditions combined, and systemically healthy. To evaluate the methodological quality of each study, the Cochrane Risk of Bias tool was applied to clinical trials[20] and the Newcastle Ottawa Scale was used for observational studies[21].

Results

The electronic search initially yielded a total of 70 articles. After removing 14 duplicates, 56 articles remained for title and abstract screening. Of these, 21 were excluded based on their title and abstract, resulting in 35 articles selected for full-text review. Following the application of the predefined inclusion/exclusion criteria, 23 articles were excluded, leaving 12 articles eligible for inclusion in this systematic review. Subsequently, a manual cluster search identified three additional studies, bringing the final number of included studies to n=15. The article selection process is illustrated in Figure 1, following the PRISMA flowchart.

The experimental studies[22-26] are summarized in Table 1. A total of 293 patients were included, with 162 assigned to the experimental group (EG) and 131 to the control group (CG). The majority of participants were male (65.9%) and presented stage 5 CKD and stage III or IV of periodontal disease. Inflammatory biomarkers were assessed in serum samples and included Interleukin-6 (IL-6), Interleukin-1- β (IL-1- β), CRP, TNF -α and Pentraxin (PTX3), with the IL-6 and IL-1- β being the most frequently analyzed—appearing in four of the five studies. Clinical parameters such as probing depth (PD) and bleeding on probing (BOP) were evaluated in all studies, while clinical attachment level (CAL), plaque index (PI), and gingival recession (GR) were assessed in fewer cases. Albumin was the most evaluated renal parameter, followed by serum creatinine, blood urea nitrogen, GFR, calcium, and phosphate.

Patients in the experimental group received oral hygiene instructions (OHI) and scaling and root planning (SRP) throughout the study periods. In contrast, the control group received only OHI—either throughout or at specific intervals—and, in some cases, SRP was administered only at the end of the study. Findings showed that CRP levels decreased in the EG across all studies, except one[26], following non-surgical periodontal treatment (NSPT). Two studies[23,24] also reported reductions in IL-6 levels in the EG, although the remaining studies did not show significant differences. Both clinical and renal parameters improved in the EG after treatment.

Author & year	Nº - (M/W) [Medium age/range]	EG - (M/W) [CG - (M/W)] // CKD; PD stage//	Inflammatory biomarkers (Sample type)	Clinical parameters	Renal parameters (Sample type)	Findings after NSPT in EG
Wehmeyer M et al., 2013 [22]	51 - (33/18) [53.4 ± 9.79]	26 - (18/8) [5 - (15/10)] // 5; III-IV//	IL -6 (Serum)	PI, GI, PD, CAL, BOP	Albumin (Serum)	No significant differences in IL -6 or albumin were observed between EC and EG at either baseline or the end of the study. At 6 months follow-up, the only statistically significant difference was in PD.
Fang F et al., 2015 [23]	97 (55 /42) [54.62]	48 – (28/20) [49 – (27/22)] //5; I -IV]//	TNF-α, IL -6, CRP (Serum)	PI, BOP, PD, GR, CAL	Albimin, urea nitrogen, Creatinine (Serum)	Following treatment, the EG showed a decrease in CRP throughout the follow-up period and in IL-6 at the final evaluation. Both clinical and renal parameters improved in the EG compared to the CG at the end of the study.
Grubbs, V., et al 2020 [24]	51 (34/17) [59.08]	34 (21/13) [17 – (16/4)] //3-4; 111 – IV//	IL – 6, CRP (Serum)	PD, PI, BOP	Creatinine, Albumin, (Serum and urine)	CRP levels decreased similarly in both groups. IL-6 was initially twice as high in the EG but declined slightly over time, whereas it increased in the GC. Periodontal and renal parameters improved in the EG
Vachhani K., et al 2021 [25]	80 (59/ 21) [50.56]	47 (32/12) [33 – (24/9)]	CRP (Serum)	OHS, PD, CAL, BOP, IPS	GFR, Albumin – Creatinine.	No significant differences were found between

		//1-4, III – IV//			(Urine)	groups at baseline. At 6 months, CRP levels were higher in the GC. However, clinical parameters, GFR and Creatinine-Albumin improved significantly in the EG.
Chung W., et al 2022 [26]	14 (10/4) [61±12]	7 (5/2) [7 – (5/2)] //5, III – IV//	CRP, TNF-α, IL1- β, IL-6, PTX3 (Serum and GCF)	PI, PD, GR, CAL, BOP	Albumin, Calcium, phosphate, PTH (-)	IL1- β in GCF decreased significantly in the EG, while serum IL-6 showed no significant change. CRP, TNF-α and PTX3 remained unchanged in both groups. PD, GR and CAL improved significantly in the EG. No significant differences in renal parameters were observed between groups

Table 1: Patient characteristics and findings from experimental studies.

Abbreviations M = men; W = women; EG = experimental group; CG = control group; GCF = gingival crevicular fluid; PI = plaque index; GI = gingival index; PD = probing depth; CAL = clinical attachment loss; BOP = bleeding of probing; GR = gingival recession; OHS = oral hygiene status; IPS = inflamed periodontal surface; PTH = parathyroid hormone.

Table 2 summarizes the characteristics of the 226 participants from the three included case-control studies[27-29]. The most assessed inflammatory biomarkers in these studies were IL-6 and CRP, while PD and CAL were the primary periodontal parameters analyzed. However, substantial heterogeneity among the study populations made it difficult to draw definitive conclusions.

Author & year	Nº - (M/W) [Medium age/range]	[Cases (n) - (M/W)] //Controls (n) (M/W)//	(CKD stage) [PD stage]	Inflammatory biomarkers (Sample type)	Clinical parameters	Renal parameters	Findings
Niedzielska I et al., 2014 [27]	22 (-) [-]	[8 (-) Patients with PD + CKD] //14 (-) Patients with CKD without any dental pathology/ /	(1-4) [-]	CRP, IL-6, IL-1β TNF-α, INF-γ (Serum)	-	Creatinine, 24-hour urine protein excretion	The control group exhibited less impaired excretory function, while the case group showed elevated levels of IL-6 and TNF-α.
Lu, H et al., 2022 [28]	138 (77/61) [18-75]	[63 (37 CKD /26 CKD+PD)] //75 (40 Healthy ones/ 35 PD)//	(5) [III – IV]	IL-1β, IL-17, IL-6, IL-8, TNF-α, MCP-1, MMP-8, CRP (Serum and GCF	PI, BOP, CI, PD, CAL	-	All clinical parameters were higher in the case group. IL-6, IL-8 and CRP in GCF, and IL-8, TNF-α, CRP, MCP-1 y MMP-8 in serum were elevated in cases. The CKD + PD subgroup had higher levels of CRP, TNF-α, MCP-1, and MMP-8 in both serum and GCF compared to controls. Cases were significantly associated with moderate/sever

							e PD and higher CRP levels.
Chaudhry A., et al 2022 [29]	66 (43-23) [-]	[33 (27/6) Patients with CKD and PD] //33 (16/17) Patients only with PD//	(3-4) [III – IV]	CRP, IL-6 (Serum)	CAL, PD	Serum urine and creatinine	SRP + OHI were performed on all participants, and at 6 weeks, all parameters were analyzed. CAL and PD were higher in the cases at baseline; but both decreased in both groups after treatment, with no significant differences. IL-6 and CRP were higher in the cases at baseline and significantly reduced in both groups after SNPT. Renal parameters decreased during the study, but with no significant changes.

Table 2: Patient characteristics and findings from observational case-control studies.
INF-γ = gamma interferon; MCP = monocyte chemoattractant protein; MMP = metalloproteinase; CI = calculus index.

Table 3 summarizes the findings of the cross-sectional studies[30-36], which included a total of 1136 patients, the majority of whom were women. Participants were categorized into four groups: individuals with only PD (n=65), only CKD (n=580), both CKD and PD (n=424), and systemically healthy individuals (n=67). As in previous studies, CRP and IL-6, PD, and CAL were the most recorded variables. Among renal parameters, serum creatinine was the most frequently analyzed, followed by blood urea nitrogen, calcium, and phosphate. Patients with both CKD and PD exhibited higher levels of systemic inflammation, and worse periodontal parameters compared to the other groups. However, no significant differences were observed in renal parameters across the groups.

Author & year	Nº - (M/W) [Medium age/range]	(Patients with only PD M/W) [Patients with only CKD M/W]	Patients with CKD+ PD (M/W)	Healthy controls (M/W)	Inflammatory biomarkers (Sample type)	Clinical parameters	Renal parameters (Sample type)	Findings
• Siribamrungwong M et al., 2014 [30]	32 (14/18) [53,2 / (53,2 ± 17,1)]	(-) [-]	32 (14/18)	-	CRP (Serum)	PI, PDI	Blood urea nitrogen, Creatinine, Albumin, calcium, phosphate (Serum)	Decrease in CRP and improvement in PI and PDI at 16 weeks after periodontal treatment in participants. Improvement in Albumin and blood urea nitrogen
Garneata L et al., 2015 [31]	238 (143/95) [57,4 ± 12,3]	(-) [58 (33/25) Stage 5]	180 (104/66) Stages III-IV Stage 5	-	CRP (Serum)	PI, CAL, PD	-	CKD + PD had significantly higher CRP values compared to patients without PD. Hemodialysis in patients with PD was higher than in patients without PD
Yoshihara, A et al., 2016 [32]	332 (0/332) [55-74]	(-) [332 (0/332)]	-	-	CRP (Serum)	PD, CAL, BOP, IPS	Cystatin C (Serum)	Sites with PD>6mm had higher CRP levels.
Hou, Y et al., 2017 [33]	36 (79/7) [50,8 ± 15,3]	(-) [66 (32/ 34) Stage 5]	70 (48/ 22) Stage I-IV Stage 5	-	CRP (Serum)	Probing	Calcium, phosphorus and PTH (Serum)	PD + CKD in hemodialysis showed higher levels of CRP. No differences between groups regarding renal parameters.
Mahendra J et al., 2022 [34]	120 (30/90) [35 – 65]	(30 (6/24)) [30 (8/22) Stage 2-4]	30 (9/21) Stages I-IV	30 (7 / 23)	TNF-α (Serum, plaque samples)	PI, GI, PD, CAL	Serum creatinine, GFR (Serum)	Clinical parameters were significantly higher in PD + CKD. Creatinine was higher in CKD and

			Stages 2-4					GFR was lower in CKD +PD. TNF-α was higher in PD group.
Onabanjo O et al., 2023 [35]	120 (68/ 52) [19 – 83]	(-) [60 (23/37) Stage 3-4]	60 (45/15) Stages III-IV Stage 3-4	-	PCR, IL-6 (Serum)	CAL, PD, GR, BOP, IPS	-	IPS and CRP were 10 times higher in CKD + PD. No significant differences in IL -6 between the two groups Relationship between PD and systemic inflammation, and relationship between CRP and IPS.
Li J et al., 2023 [36]	158 (91/ 67) [19-71 (38, 15 ± 12,00)]	(35 (27/8)) [34 (15/19) IgAn]	52 (29/23) Stage I-IV	37 (20/17)	IL-1β, TNF-α, IL-6 (Serum)	PD, PI, BOP, CAL	Creatinine, blood uric acid and urea nitrogen and 24-hour urine protein (Serum and urine)	No differences in renal parameters between CKD and y CKD + PD. PI and BOP were higher in PD and CKD, as well as PD. All clinical parameters were higher in PD + CKD group. Only IL-6 was significantly higher in PD + CKD group than in healthy controls.

Table 3: Patient characteristics and findings from cross-sectional studies
PDI = periodontal dental index; IPS = inflamed periodontal surface; IgAn = IgA nephropathy.

The qualitative analysis of the experimental studies was performed using Cochrane Risk of Bias 2 (ROB 2) tool for systematic reviews[20], revealing that three out of the five studies presented a high risk of bias. The quality of the observational studies was evaluated using the Newcastle Ottawa Scale[21], with 50% of these studies also demonstrating a high risk of bias (Table 4).

STUDY	TYPE	D1/ SELECTION	D2/ COMPARABILITY	D3/ EXPOSITION	D4	D5	TOTAL
Wehmeyer M et al., 2013 [24]	Experimental study	🔴	🟡	🟢	🟡	🟢	High risk
Fang F et al., 2015 [25]	Experimental study	🟢	🟢	🟢	🟢	🟡	Low risk
Grubbs, V., et al 2020 [26]	Experimental study	🟡	🔴	🔴	🔴	🟡	High risk
Vachhani K., et al 2021 [27])	Experimental study	🟡	🟢	🟢	🟢	🟢	Low risk
Chung W., et al 2022 [28]	Experimental study	🔴	🟡	🟢	🟢	🟢	High risk
Niedzielska I et al., 2014 [29]	Case – control study	***	*	**	-	-	High risk
Lu, H et al., 2022 [30]	Case – control study	****	**	**	-	-	Low risk
Chaudhry A., et al 2022 [31])	Case – control study	***	**	***	-	-	Low risk
• Siribamrungwong M et al., 2014 [32]	Cross sectional study	**	**	**	-	-	High risk
Garneata L et al., 2015 [33]	Cross sectional study	**	**	**	-	-	High risk
Yoshihara, A et al., 2016 [34]	Cross sectional study	*	**	**	-	-	High risk
Hou, Y et al., 2017 [35]	Cross sectional study	****	**	***	-	-	Low risk
Mahendra J et al., 2022 [36]	Cross sectional study	***	*	***	-	-	Low risk

Onabanjo O et al., 2023 [37]	Cross sectional study	***	**	***	-	-	Low risk
Li J et al., 2023 [38]	Cross sectional study	***	*	**	-	-	High risk

Table 4: Risk of bias assessment using the Cochrane risk of bias 2 (ROB2) (for experimental studies) -in gray-; and the Newcastle Ottawa Scale (for observational studies).
Domain 1 = Risk of bias arising from the randomization process. Domain 2 = Risk of bias due to deviations from the intended interventions. Domain 3 = Risk of bias due to missing outcome data. Domain 4 = Risk of bias in measurement of the outcome. Domain 5 = Risk of bias in selection of the reported result.

Discussion

The studies included in this systematic review demonstrated a clear association between periodontal disease and chronic kidney disease with respect to inflammatory biomarkers, as well as periodontal and renal clinical parameters.

Observational studies revealed a greater inflammatory burden in patients with both CKD and PD compared to other patient groups. This was particularly evident in elevated CRP levels, and to a lesser extent, in IL-6 and TNF -α levels[27,30]. Clinical periodontal parameters—specifically PD, CAL and PI—were also more severe in these patients. With respect to renal parameters, only one study[33] reported a higher number of dialysis cases, while another[34] observed a lower GFR in patients with both conditions. These findings suggest that individuals with coexisting CKD and PD exhibit heightened systemic inflammation, and at least one of the conditions—PD in this case—appears to be more clinically aggravated, aligning with the conclusions of a previous systematic review[15]. Additionally, lower albumin levels were observed in patients with both entities, which may indicate a poorer prognosis for CKD progression.

In the included studies where non-surgical periodontal treatment was applied[22-26], all patients presented with both CKD and PD. Improvements in inflammatory biomarkers were observed in patients who received NSPT compared to those who did not, particularly in CRP and IL-6 levels[23-25,32]. However, three studies[22, 24, 31] reported no statistically significant differences in these markers. Periodontal parameters generally improved following NSPT, with the exception of one study[31] in which both the experimental and control groups showed similar reductions. Regarding renal parameters, three studies[22,26,31] found no significant differences between the treatment and control groups.

These findings suggest that non-surgical periodontal treatment may reduce the concentration of inflammatory biomarkers and, consequently, the systemic low-grade inflammation. As a result, an improvement in periodontal disease may be observed, as reflected by more favorable clinical periodontal parameters, along with potential benefits in chronic kidney disease, indicated by improved renal markers. A previous systematic review[37] similarly reported a decrease in CRP levels following NSPT in dialysis patients, along with reductions in IL-6 and an increase in albumin levels—although the latter changes were not statistically significant. Based on these findings, it was concluded that non-surgical periodontal treatment may help reduce systemic inflammatory burden, particularly in terms of CRP.

Recent studies have sought to investigate the relationship between CKD and PD by analyzing inflammatory and renal parameters. Research comparing patients in the early stages of CKD with those in stage 5 (undergoing dialysis)[5,38] found that IL-6 levels were significantly higher in stage 5 patients prior to dialysis, compared to other

inflammatory biomarkers. In terms of periodontal parameters, CAL and PI were significantly higher in patients with advanced CKD, as was serum creatinine. The authors attributed these findings to the more severely impaired renal function in advanced CKD patients, which result in the accumulation of toxic substances in the bloodstream. Another study compared the periodontal status of systemically healthy individuals with that of patients in stage 5 CKD[39]. In this study, all clinical periodontal parameters were more severely affected in dialysis patients, who also exhibited higher serum levels of CRP, IL-6 and IL-8. These results suggest that, while differences in inflammatory and periodontal status among between CKD stages may not always be statistically significant, patients with advanced CKD tend to have poorer periodontal health and a heightened inflammatory profile compared to healthy individuals. Non-surgical periodontal treatment (NSPT), beyond improving periodontal health, may also support chronic kidney disease management by reducing systemic inflammatory burden and potentially slowing disease progression. As such, periodontal care should be considered an important component in the overall management of patients with CKD to help improve their quality of life.

No studies to date have demonstrated improvements in periodontal disease (PD) through the treatment of chronic kidney disease (CKD). Therefore, future research is necessary to further explore the bidirectional relationship between these conditions, particularly through studies that also incorporate surgical periodontal treatment. One of the primary limitations of this systematic review is the heterogeneity of study designs—including randomized clinical trials, case-control studies, and cross-sectional studies—which complicates direct comparisons across studies. Additionally, the wide range of parameters—spanning inflammatory, clinical, and renal markers—may influence the interpretation of results. Moreover, a high risk of bias was identified in three of the experimental studies and five of the observational studies, further limiting the strength of the conclusions.

Conclusions

Patients with both periodontal disease (PD) and chronic kidney disease (CKD) exhibit a greater inflammatory burden compared to those with only one of these conditions. Both diseases share common inflammatory biomarkers, particularly C-reactive protein (CRP), interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-α). Non-surgical periodontal treatment (NSPT) has been shown to improve clinical outcomes in both PD and CKD, as well as to reduce levels of inflammatory biomarkers, supporting the existence of a relationship between the two conditions. However, no studies to date have evaluated the effects of surgical periodontal treatment or the potential improvement of PD following treating CKD treatment. Consequently, a bidirectional relationship between PD and CKD cannot yet be confirmed.

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Institutional Review Board Statement

Declared none.

Author Contributions

Conceptualization: J.L-L. and C.O-C.; Methodology: A.G-S, C.O-C, A.M-M, B.G-N.; Data curation: A.G-S, C.O-C and E.J-S.; Validation: all authors; Writing original draft preparation: A.G-S., C.O-C.; Writing-review and editing: A.G-S., C.O-S., and J.L.-L.; All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest, financial or otherwise.

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