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Prevalence and determinants of oral lesions in patients with stage 3–5 non-dialysis chronic kidney disease at Yaoundé University Teaching Hospital: a cross-sectional study

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Research Article

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Abstract

Background

Chronic kidney disease (CKD) is associated with a wide range of oral abnormalities, but oral health may receive limited attention during routine CKD care, particularly in resource-limited settings. Data on oral lesions among patients with CKD in Cameroon remain limited.

Methods

We conducted a cross-sectional study from November 2017 to May 2018 among adults with stage 3–5 non-dialysis CKD attending the nephrology outpatient clinic of Yaoundé University Teaching Hospital. Participants with acute inflammatory illness, psychiatric disorders, malignancy, or complete edentulism were excluded. Sociodemographic and clinical information was obtained by interview and from medical records, followed by a full-mouth clinical examination. Associations were assessed using bivariate and multivariable logistic regression, with statistical significance set at $p < 0.05$.

Results

Eighty participants were included; 52 (65.0%) were men and the mean age was 58 ± 12.3 years. Hypertension (59/80, 73.75%) and diabetes (33/80, 41.25%) were the most frequent comorbidities. Seventy-five participants (93.75%) had at least one oral lesion. Mucosal lesions were identified in 57 participants (71.25%), dental lesions in 34 (42.50%), and periodontal lesions in 31 (38.75%). Halitosis (50/80, 62.50%) and xerostomia (26/80, 32.50%) were the most frequent mucosal findings. Among participants with dental lesions, enamel hypoplasia was most frequent (17/34, 50.0%), followed by caries (11/34, 32.35%). Among participants with periodontal lesions, mild periodontitis was most common (14/31, 45.16%). In multivariable analyses, mucosal lesions were associated with age ≥ 40 years, male sex, and smoking; periodontal lesions were associated with age ≥ 40 years, diabetes, smoking, and brushing fewer than twice daily; dental lesions were associated with education below secondary level and brushing fewer than twice daily.

Conclusions

Oral lesions were highly prevalent among adults with stage 3–5 non-dialysis CKD in this hospital-based study. Integration of routine oral health assessment, preventive dental care, and oral hygiene counselling into CKD management may improve comprehensive patient care.

Background

The oral cavity can provide clinically relevant information about systemic health. Chronic kidney disease (CKD), like many systemic disorders, may be accompanied by oral abnormalities arising from the disease process, associated metabolic disturbances, comorbidities, or treatment. Oral manifestations may involve the teeth, oral mucosa, periodontium, salivary glands, tongue, and other oral structures(1,2) .

CKD is defined as abnormalities of kidney structure or function that persist for more than three months and have implications for health (3). CKD is a major global public health problem, and advanced stages are associated with substantial morbidity and mortality (4–7). Patients with CKD may develop anemia, metabolic disturbances, malnutrition, altered immune function, and other complications that can adversely affect oral health (8).

Previous studies have reported a high burden of oral findings among people with CKD, including xerostomia, halitosis, oral mucosal lesions, dental abnormalities, and periodontal disease (1, 2, 8–10). A possible bidirectional relationship between oral disease and systemic disease has also been described, particularly in relation to periodontal disease and chronic inflammatory conditions (2, 9).

In Cameroon, CKD represents an important health burden, while routine dental assessment is not consistently integrated into nephrology care. There is limited local evidence describing the clinical burden and determinants of oral lesions among non-dialysis patients with advanced CKD. This study therefore assessed the prevalence and clinical distribution of oral lesions and explored factors associated with mucosal, dental, and periodontal lesions among adults with stage 3–5 non-dialysis CKD attending Yaoundé University Teaching Hospital.

Methods

Study design and setting

This was a hospital-based cross-sectional study conducted from November 2017 to May 2018 in the nephrology outpatient clinic of Yaoundé University Teaching Hospital, Cameroon.

Study population and eligibility

Participants were adults aged ≥ 18 years with stage 3–5 CKD who were not receiving dialysis and who consented to participate. Patients with acute inflammatory illnesses, psychiatric disorders, malignancies, or complete edentulism were excluded.

Sample size

The thesis protocol calculated a target sample size of 138 using a cross-sectional study formula and an expected prevalence of oral lesions of 90%. Eighty participants were ultimately enrolled and examined. The difference between the calculated and achieved sample sizes is acknowledged as a limitation.

Data collection and clinical examination

After ethical clearance and administrative authorization, eligible patients were informed about the study and provided consent. Sociodemographic and clinical information was obtained by interview and review of medical records. A full-mouth examination was then performed and recorded on a structured data collection form.

Dental assessment included recording missing, decayed, filled, and abnormal teeth. Periodontal assessment included evaluation of plaque, bleeding on probing, probing depth, and clinical attachment loss. Periodontal findings were categorized as no periodontitis, mild, moderate, or severe periodontitis according to the clinical criteria described in the study protocol. Oral mucosal examination assessed pain, burning or metallic taste, halitosis, xerostomia, ulceration, petechiae/ecchymosis, candidiasis, herpes-related findings, and other visible abnormalities.

Blood pressure, weight, height, and body mass index were also recorded. Diabetes and hypertension were defined from a documented or self-reported physician diagnosis, with hypertension additionally defined by blood pressure ≥ 140/90 mmHg or use of antihypertensive medication.

CKD classification

CKD stage was classified as stage 3a (estimated glomerular filtration rate 45–59 mL/min/1.73 m^2), stage 3b (30–44 mL/min/1.73 m^2), stage 4 (15–29 mL/min/1.73 m^2), or stage 5 (< 15 mL/min/1.73 m^2), as reported in the study protocol.

Statistical analysis

Data were analysed using SPSS version 20.0. Categorical variables were summarized using frequencies and percentages, while continuous variables were summarized using means, medians, ranges, and standard deviations. Associations between categorical variables were assessed using the chi-square test. Bivariate logistic regression was used to identify factors associated with mucosal, periodontal, and dental lesions, followed by multivariable logistic regression including variables selected from the bivariate analyses. A p-value < 0.05 was considered statistically significant.

Ethical considerations

Ethical clearance was obtained from the ethics committee of the Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, and administrative authorization was obtained from Yaoundé University Teaching Hospital. Participants provided informed consent before enrolment. Data were collected anonymously and handled confidentially.

Results

Participant characteristics

Eighty participants were included. Fifty-two (65.0%) were men. The mean age was 58 ± 12.3 years, with an age range of 23–84 years. Most participants had completed tertiary education (40.0%) or secondary education (23.75%). Half reported financing healthcare themselves, while 38.75% relied on family support and 11.25% had insurance.

Characteristic	N	%
Male sex	52	65.0
Female sex	28	35.0
Age, mean ± SD	58 ± 12.3	—
Age 20–39 years	3	3.75
Age 40–59 years	38	47.50
Age 60–79 years	39	48.75
No formal education	11	13.75
Primary education	18	22.50
Secondary education	19	23.75
Tertiary education	32	40.00

Clinical characteristics

Hypertension was present in 59 participants (73.75%) and diabetes in 33 (41.25%). HIV infection was documented in 9 (11.25%), and 13 participants (17.33%) were reported as smokers. Stage 5 CKD was the most common CKD category (31/80, 38.75%), followed by stage 4 (21/80, 26.25%).

Clinical characteristic	N	%
Hypertension	59	73.75
Diabetes	33	41.25
HIV	9	11.25
Smoking	13	16.25
Hypertensive nephropathy	27	33.75
Diabetic nephropathy	17	21.25
Chronic glomerulonephritis	13	16.25
Polycystic kidney disease	8	10.00
HIV-associated nephropathy	7	8.75
Unknown CKD etiology	8	10.00
Stage 3a CKD	14	17.50
Stage 3b CKD	14	17.50
Stage 4 CKD	21	26.25
Stage 5 CKD	31	38.75

Oral hygiene practices

Forty-five participants (56.25%) had not visited a dentist for at least 12 months, while 10 (12.50%) had never consulted a dentist. Seventy-five (93.75%) reported using a toothbrush. Thirty-six (45.0%) brushed fewer than twice daily, 65 (81.25%) did not use dental floss, and 53 (66.25%) reported frequent toothpick use.

Oral hygiene characteristic	N	%
Last dental visit < 3 months	11	13.75
Last dental visit 3–12 months	14	17.50
Last dental visit ≥ 12 months	45	56.25
Never visited a dentist	10	12.50
Uses toothbrush	75	93.75
Does not use toothbrush	5	6.25
Brushes < 2 times/day	36	45.00
Brushes ≥ 2 times/day	44	55.00
Uses dental floss	15	18.75
Does not use dental floss	65	81.25
Frequent toothpick use	53	66.25
Does not frequently use toothpick	27	33.75

Prevalence and distribution of oral lesions

At least one oral lesion was identified in 75 of the 80 participants (93.75%). Mucosal lesions were identified in 57 participants (71.25%), dental lesions in 34 (42.50%), and periodontal lesions in 31 (38.75%).

Oral lesion category	N	% of all participants
Any oral lesion	75	93.75
Mucosal lesion	57	71.25*
Dental lesion	34	42.50
Periodontal lesion	31	38.75*

Percentages for the three major lesion categories were recalculated using the total sample (N = 80): 57/80 = 71.25% for mucosal lesions, 34/80 = 42.50% for dental lesions, and 31/80 = 38.75% for periodontal lesions.

Mucosal lesions

Halitosis was the most frequently reported mucosal finding (50/80, 62.50%), followed by xerostomia (26/80, 32.50%). Ulcers and petechiae were each reported in 12 participants (15.0%), aphthous lesions in 10 (12.50%), herpes-related lesions in 5 (6.25%), and candidiasis in 2 (2.50%).

Mucosal finding	N	%
Halitosis	50	62.50
Xerostomia	26	32.50
Ulcers	12	15.00
Petechiae	12	15.00
Aphthous lesions	10	12.50
Herpes	5	6.25
Candidiasis	2	2.50

Periodontal lesions

Periodontal lesions were identified in 31 participants. Mild periodontitis accounted for 14 cases (45.16%), moderate periodontitis for 13 (41.93%), and severe periodontitis for 4 (12.90%).

Periodontal category	N	% among periodontal lesions
Mild periodontitis	14	45.16
Moderate periodontitis	13	41.93
Severe periodontitis	4	12.90

Dental lesions

Dental lesions were identified in 34 participants. Enamel hypoplasia was the most frequent dental finding (17/34, 50.0%), followed by caries (11/34, 32.35%), attrition (4/34, 11.76%), and abrasion (2/34, 5.88%).

Dental finding	N	% among dental lesions
Enamel hypoplasia	17	50.00
Caries	11	32.35
Attrition	4	11.76
Abrasion	2	5.88

Factors associated with oral lesions

On bivariate analysis, mucosal lesions were associated with age ≥ 40 years ($p = 0.047$), male sex ($p = 0.004$), and smoking ($p = 0.015$). In multivariable analysis, the thesis reported associations with age ≥ 40 years (OR 0.121, 95% CI 0.009–1.379; $p = 0.047$), male sex (OR 1.654, 95% CI 1.119–2.444; $p = 0.004$), and smoking (OR 0.728, 95% CI 0.630–28.941; $p = 0.015$).

Periodontal lesions were associated on bivariate analysis with age ≥ 40 years (p = 0.030), diabetes (p = 0.001), smoking (p = 0.004), and brushing fewer than twice daily (p = 0.023). In multivariable analysis, reported associations were age ≥ 40 years (OR 2.678, 95% CI 1.997–3.591; p = 0.030), diabetes (OR 5.035, 95% CI 1.906–13.300; p = 0.001), smoking (OR 7.302, 95% CI 1.819–29.304; p = 0.004), and brushing fewer than twice daily (OR 1.935, 95% CI 1.091–3.432; p = 0.023).

For dental lesions, education below secondary level (p = 0.048) and brushing fewer than twice daily (p = 0.033) were significant on bivariate analysis. Multivariable analysis reported education below secondary level (OR 2.538, 95% CI 1.002–6.430; p = 0.048) and brushing fewer than twice daily (OR 2.678, 95% CI 1.074–6.678; p = 0.033) as associated factors.

Discussion

This study found a high prevalence of oral lesions among adults with stage 3–5 non-dialysis CKD, with 93.75% of participants presenting with at least one oral lesion. This finding is broadly consistent with previous reports describing a substantial burden of oral abnormalities among patients with CKD (1, 8). The high frequency observed in this study may reflect the combined effects of advanced kidney dysfunction, comorbidities, medication exposure, dietary restrictions, impaired oral hygiene, and limited access to preventive dental care.

The study population was predominantly male and had a mean age of 58 years. Hypertension and diabetes were the most common comorbidities, consistent with their major contribution to CKD in many populations. These comorbid conditions are also relevant to oral health because diabetes and other chronic conditions may increase susceptibility to periodontal inflammation and other oral diseases.

Oral hygiene practices suggested important opportunities for prevention. Nearly half of participants (36/80, 45.0%) brushed fewer than twice daily, 65 (81.25%) did not use dental floss, and 45 (56.25%) had visited a dentist at least 12 months previously. Ten participants (12.50%) had never visited a dentist.

Mucosal findings were the most prominent group of oral abnormalities. Halitosis was the most frequent finding, followed by xerostomia. Previous studies have similarly reported halitosis and xerostomia among patients with CKD (1, 8, 9). Xerostomia may be influenced by fluid restriction, altered salivary function, and medication use, while halitosis may be related to oral dryness, inadequate oral hygiene, and uremic changes (8).

Periodontal lesions were also common, with mild periodontitis accounting for the largest proportion of periodontal cases. Age, diabetes, smoking, and infrequent tooth brushing were associated with periodontal lesions in the multivariable analysis. These findings are clinically plausible and are consistent with the literature linking periodontal disease to older age, diabetes, smoking, and inadequate oral hygiene (2).

Dental lesions were identified in 42.5% of participants. Enamel hypoplasia was the most frequently reported dental abnormality, followed by caries. Lower educational attainment and brushing fewer than twice daily were associated with dental lesions. The association with oral hygiene is consistent with the preventive role of regular tooth brushing in reducing plaque-related dental disease.

The findings have implications for multidisciplinary CKD care. Routine oral screening by healthcare providers, timely dental referral, individualized oral hygiene counselling, and management of modifiable risk factors such as smoking and poor oral hygiene may help reduce the oral disease burden in this population.

Strengths and limitations

This study provides local clinical data on oral health among non-dialysis patients with stage 3–5 CKD and evaluated mucosal, periodontal, and dental findings in the same participants. However, several limitations were considered. First, the study was conducted at a single hospital and included only 80 participants, limiting statistical power and generalizability. second, periodontal diagnoses were based on clinical examination without complementary radiographic or laboratory investigations. Third, mucosal diagnoses were made clinically without histopathological confirmation.

Conclusions

Oral lesions were highly prevalent among adults with stage 3–5 non-dialysis CKD attending Yaoundé University Teaching Hospital. Mucosal lesions, particularly halitosis and xerostomia, were common, while enamel hypoplasia and caries were the main dental findings and mild periodontitis was the most frequent periodontal diagnosis. Older age, male sex, smoking, diabetes, lower educational attainment, and inadequate tooth-brushing frequency were associated with selected categories of oral lesions. These findings support the integration of routine oral health assessment, preventive dental care, oral hygiene education, and appropriate dental referral into multidisciplinary CKD management.

Recommendations

Future studies should use larger, multicentre samples and standardized periodontal and mucosal diagnostic methods to better estimate the national burden of oral disease in people with CKD. Healthcare practitioners should consider periodic dental assessment and oral hygiene counselling as part of routine CKD care, with particular attention to modifiable risk factors such as smoking and inadequate oral hygiene.

Declarations

Ethics approval and consent to participate

The study received ethical clearance from the ethics committee of the Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, and administrative authorization from Yaoundé University Teaching Hospital. Written informed consent was obtained from participants before enrolment.

Consent for publication

Not applicable. No individually identifiable participant information is presented in this manuscript.

Competing interests

The author declares no competing interests.

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Authors' contributions

SEN conceived the study, collected and analysed the data, interpreted the findings, and prepared the manuscript. The author read and approved the final manuscript.

EAE contributed to the study design, interpretation of the findings, and critical revision of the manuscript for important intellectual content.

NJT contributed to the study implementation, interpretation of the findings, and critical revision of the manuscript for important intellectual content.

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Availability of data and materials

The datasets generated and analysed during the study are not publicly available.

References

1. Oyetola EO, Owotade FJ, Agbelusi GA, Fatusi OA, Sanusi AA. Oral findings in chronic kidney disease: implications for management in developing countries. BMC Oral Health. 2015;15:24. 10.1186/s12903-015-0004-z . PubMed PMID: 25888327; PubMed Central PMCID: PMC4350651.
2. Wahid A, Chaudhry S, Ehsan A, Butt S, Ali Khan A. Bidirectional Relationship between Chronic Kidney Disease & Periodontal Disease. Pak J Med Sci. 2013;29(1):211–5. 10.12669/pjms.291.2926 . PubMed PMID: 24353542; PubMed Central PMCID: PMC3809193.

3. Romagnani P, Remuzzi G, Glassock R, Levin A, Jager KJ, Tonelli M, et al. Chronic kidney disease. Nat Rev Dis Primers. 2017;3:17088. 10.1038/nrdp.2017.88 . PubMed PMID: 29168475.
4. Hill NR, Fatoba ST, Oke JL, Hirst JA, O'Callaghan CA, Lasserson DS, et al. Global Prevalence of Chronic Kidney Disease - A Systematic Review and Meta-Analysis. PLoS ONE. 2016;11(7):e0158765. 10.1371/journal.pone.0158765 . PubMed PMID: 27383068; PubMed Central PMCID: PMC4934905.
5. Kaze FF, Halle MP, Mopa HT, Ashuntantang G, Fouda H, Ngogang J, et al. Prevalence and risk factors of chronic kidney disease in urban adult Cameroonians according to three common estimators of the glomerular filtration rate: a cross-sectional study. BMC Nephrol. 2015;16(1):96. 10.1186/s12882-015-0102-9.
6. Systemic Consequences of Poor Oral Health in Chronic Kidney Disease Patients | Request PDF. ResearchGate. 2026 Aug 6. 10.2215/CJN.05470610
7. Patil S, Khaandelwal S, Doni B, Rahuman F, Kaswan S. Oral manifestations in chronic renal failure patients attending two hospitals in North Karnataka, India. Oral Health Dent Manag. 2012;11(3):100–6. PubMed PMID: 22976569.
8. Proctor R, Kumar N, Stein A, Moles D, Porter S. Oral and dental aspects of chronic renal failure. J Dent Res. 2005;84(3):199–208. doi:10.1177/154405910508400301 PubMed PMID: 15723858.
9. Saini R, Sugandha null, Saini S. The importance of oral health in kidney diseases. Saudi J Kidney Dis Transpl. 2010;21(6):1151–2. PubMed PMID: 21060196.
10. Kaze FF, Meto DT, Halle MP, Ngogang J, Kengne AP. Prevalence and determinants of chronic kidney disease in rural and urban Cameroonians: a cross-sectional study. BMC Nephrol. 2015;16:117. 10.1186/s12882-015-0111-8 . PubMed PMID: 26220538; PubMed Central PMCID: PMC4518633.