Relationship Between Diabetes and Periodontal Disease: An Observational Study of Knowledge, Attitudes, and Practices of Diabetics in Cameroon

Essama Eno Belinga L[1], Mekieje Tumchou MP[2], Mbango Ekouta ND[1], Kengne SI[2], Bell Ngan W[3], Ebana Mvogo C[4], Ngono Ngane RA[5], Bongue B[6], Etoa Etoga MC[4]

[1] Faculty of Medicine and Pharmaceutical Sciences, University of Douala, Douala, Cameroon
[2] Institute of Health Sciences, University of the Mountains, Bangangté, Cameroon
[3] Regional Military Hospital No. 2, Douala, Cameroon
[4] Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Yaoundé, Cameroon
[5] Laboratory of Biochemistry, Faculty of Sciences, University of Douala, Douala, Cameroon
[6] Sainbiose Laboratory, Jean-Monnet University of St-Etienne, St-Etienne, France
Correspondence: Essama Eno Belinga Lawrence
Email: laubell@yahoo.fr

ABSTRACT

Objective: The interrelationship between diabetes and periodontal disease has been reported in Cameroon; therefore, a mutual prevention approach for these two chronic non-communicable diseases appears essential in our country. The objective of this study was to assess the knowledge, attitudes, and practices of Cameroonian diabetics with respect to periodontal health.

Materials and Methods: A bicentric cross-sectional observational study was conducted from February 1st to April 30th, 2024, in two selected hospitals in Yaoundé. Simple random sampling was used to recruit diabetics who provided consent. Sociodemographic data, knowledge of the interrelationship between periodontal disease and diabetes, attitudes of diabetics towards dental consultations and treatment, as well as their oral hygiene habits, were collected using a pre-tested questionnaire. Clinical and paraclinical data were retrieved from medical records.

Results: A total of 208 participants were recruited, with a mean age of 60 ± 11 years; 142 (68.3%) were women. Two hundred and one (96.6%) participants had type 2 diabetes; 187 (89.9%) reported being unaware of the relationship between diabetes and periodontal disease. Eighty-seven (41.8%) participants had never consulted a dentist, while only 10 (4.8%) had received a preventive oral consultation. A total of 165 (79.3%) reported using toothpicks. After multivariate analysis, factors associated with inadequate practices were poor knowledge (OR = 2.2; p = 0.044) and approximate attitudes (OR = 2.8; p = 0.013).

Conclusion: This study highlights the need to further educate Cameroonian type 2 diabetics on the interrelationship between diabetes and periodontal disease, to modify their attitudes and behaviours regarding dental consultation, and to optimize their oral hygiene practices.

Keywords: Diabetes, periodontal disease, knowledge, attitudes, practices, Cameroon

INTRODUCTION

Diabetes mellitus is the collective term for heterogeneous metabolic disorders whose main finding is chronic hyperglycaemia.[1] The cause is either disturbed insulin secretion, disturbed insulin effect, or usually both.[1] It is responsible for three-quarters of deaths and affects 589 million people worldwide, including 25 million in the African region; in Cameroon, its prevalence is 6.9%.[2] Diabetes exposes individuals to long-term complications that can affect all organs of the human body, including the oral cavity.

Periodontal health can be defined as the absence of clinically detectable inflammation on an anatomically intact, reduced, or treated periodontium.[3,4] It is an integral part of oral health and should be understood as both a preventive process and a therapeutic goal.[4] Periodontitis, a severe form of periodontal disease, is a chronic inflammatory disease associated with subgingival dysbiotic biofilm, characterized by the progressive and irreversible destruction of dental supporting tissues.[3] It represents a global public health issue, and its frequency is estimated at 15% in Cameroon.[5] Untreated, periodontitis leads to tooth loss with negative repercussions on masticatory function, aesthetics, quality of life, and general health.[3,5]

The evidence of the bidirectional link between type 2 diabetes (T2D) and periodontitis has been reported by many scientific studies.[6-13] From an epidemiological perspective, T2D and periodontitis share many systemic, behavioural, and genetic risk factors. Studies report a high incidence and prevalence of periodontitis in T2D, as well as a risk of developing moderate to severe forms of periodontitis in those with poor glycaemic control compared to those with controlled diabetes and non-diabetics. Periodontitis is also described as the sixth complication of diabetes after retinopathies, nephropathies, and macrovascular diseases.[12,13] Conversely, scientific evidence has proven that periodontitis has a significant impact on the incidence and prevalence of type 2 diabetes, glycaemic control, and the occurrence of complications.[6,7,10-12]

The beneficial effect of non-surgical periodontal treatment (NSPT) on reducing HbA1c levels has also been reported, with the magnitude of HbA1c reductions ranging from 0.27% to 0.48% at three to four months after periodontal therapy.[6,7,14]

From a pathophysiological perspective, several mechanisms attempt to explain this link.[6,7] Diabetes induces endothelial cell dysfunction, resulting in reduced blood supply to gingival tissues and decreased defence against microbial attacks. Hyperglycaemia leads to an increase in circulating inflammatory mediators in periodontal tissues, contributing to chronic, ineffective, non-resolving, and destructive local inflammation as well as systemic inflammation. Increased levels of pro-inflammatory mediators linked to the immuno-inflammatory response induced during dysbiosis promote insulin resistance and therefore glycaemic imbalance.

Previous studies conducted in Cameroon reported prevalence of periodontitis in diabetics ranging from 12% to 52%, and periodontitis was found to be significantly associated with peripheral arterial disease (PAD) in type 2 diabetics (OR = 3.6).[15,16] Similarly, a Cameroonian study found that immediate NSPT induced a reduction in HbA1c levels by 3.0 ± 2.4 percentage points, from 9.7 ± 1.6% at baseline to 6.7 ± 2.0% three months after NSPT (p < 0.001).[17]

Therefore, mutual management of these two chronic non-communicable diseases appears essential. This management requires the full cooperation of diabetics, who must be informed both of their periodontal risk and the importance of maintaining good oral care habits. Epidemiologic evidence of the interrelationship between diabetes and periodontal disease has been reported in Cameroonians, but no studies have been conducted on their periodontal educational needs. Hence, the objective of this study was to assess the knowledge of Cameroonian diabetics regarding the link between diabetes and periodontal disease and their attitudes and practices in terms of periodontal health.

METHODS

Study Design
A bicentric cross-sectional observational study was conducted from February 1st to April 30th, 2024.

Setting
The study was carried out at two selected hospitals in Yaoundé, Cameroon: the National Centre for Diabetology and Hypertension (NCDH) of the Yaoundé Central Hospital and the Endocrinology Outpatient Department (EOD) of the Yaoundé General Hospital. Both centers are tertiary healthcare facilities that serve as major referral points for diabetic patients in the Central Region of Cameroon, providing specialized diabetes care and follow-up services.

Participants
The study population was drawn from the active patient list of diabetic patients attending these two departments for their routine follow-up visits.

Eligibility criteria:

· **Inclusion:** Diabetic patients of either sex who provided informed consent to participate.

· **Exclusion:** Patients with a diabetes diagnosis of less than three months, pregnant women, and breastfeeding women were excluded [to avoid potential confounding related to recent diagnosis or physiological changes affecting glycemic control and periodontal status].

Sampling method: Simple random sampling was used to recruit participants from the daily clinic attendance registers [based on the estimated daily patient flow to achieve the target sample size].

Variables
The primary outcomes were knowledge, attitudes, and practices (KAP) regarding the relationship between diabetes and periodontal disease. Secondary outcomes included glycemic control status.

Predictor variables included:

· Sociodemographic characteristics: age, sex, level of education, monthly income, residential area, health insurance status
· Diabetes-related characteristics: type of diabetes, duration since diagnosis, treatment modality, glycemic control, comorbidities

[Knowledge was defined as awareness and understanding of the bidirectional relationship between diabetes and periodontal disease. Attitudes were defined as predispositions toward dental consultations and oral care. Practices were defined as oral hygiene behaviors and healthcare-seeking patterns.]

Data Sources and Measurement
A pre-tested questionnaire was administered to participants through a 20-minute interview. The questionnaire collected information on sociodemographic characteristics, knowledge regarding the interrelationship between diabetes and periodontal disease, attitudes towards dental consultations and oral care, and oral hygiene practices. [The questionnaire was pre-tested among a similar patient population to assess clarity and comprehensibility before the main study.]

Clinical and paraclinical data were retrieved from medical records, including glycated hemoglobin (HbA1c) levels within the preceding three months. Glycemic control was interpreted using the standard threshold[3]: controlled diabetes (HbA1c < 7%)

and uncontrolled diabetes (HbA1c $\geq 7\%$).

Domain	Score Frequency (%)	Level of Appreciation
Knowledge	< 25%	Poor
	25–49%	Insufficient
	50–69%	Average
	≥ 70%	Good
Attitudes	< 25%	Harmful
	25–49%	Wrong
	50–69%	Approximate
	≥ 70%	Right
Practices	< 50%	Harmful
	50–69%	Inadequate
	≥ 70%	Adequate

Bias
To minimize selection bias, simple random sampling was employed, and clear inclusion and exclusion criteria were applied consistently. Interviewer bias was reduced through standardized questionnaire administration. Social desirability bias was minimized by assuring participants of confidentiality and emphasizing that there were no right or wrong answers. Recall bias was addressed by using medical records for clinical data (HbA1c) rather than self-report.

Study Size
The minimum sample size was scientifically determined to be 98.7 and rounded to 100 using the Cochran formula based on a diabetes prevalence of 6.9% in Cameroon[2]. [To account for potential non-response and incomplete data, the sample size was increased, ultimately recruiting 208 participants, which exceeded the minimum requirement and provided adequate power for subgroup analyses.]

Quantitative Variables
Quantitative variables (age, duration of diabetes) were expressed as mean ± standard deviation or median with interquartile range based on distribution normality. Qualitative variables were expressed as numbers and proportions.
Continuous variables were categorized as follows:
· Age groups: <40, 40–59, 60–79, ≥80 years
· Monthly income: <50,000, 50,000–100,000, 100,000–150,000, >150,000 FCFA
· Level of education: None, Primary, Secondary, University

· Residential area: Urban, Rural, Semi-urban

· Knowledge, attitude, and practice levels: As per the KAP evaluation grid above

Statistical Methods
Data were analyzed using SPSS (Statistical Product and Service Solutions) version 23 software.

Descriptive statistics: Quantitative variables were expressed as mean (± standard deviation) or median (± interquartile range). Qualitative variables were expressed as numbers and proportions.

Inferential statistics: The chi-square test (χ^2) and Fisher's exact test were used to compare proportions and examine associations between categorical variables, including:

· Associations between sociodemographic characteristics and KAP levels

· Associations between diabetes-related characteristics and KAP levels

· [Gender-based differences in KAP outcomes]

Multivariate analysis: Multivariate analysis using binary logistic regression was employed to determine factors associated with inadequate practices. [Variables with $p < 0.20$ in bivariate analysis were entered into the regression model.] Adjusted odds ratios (ORa) with 95% confidence intervals (CI) were calculated.

The significance threshold was set at $p < 0.05$ for all statistical tests.

There were no missing data for questionnaire items, as interviews ensured complete responses. For HbA1c data, 48 participants (23.1%) had no recent results and were classified as "indeterminate" for glycemic control; these participants were excluded from analyses involving glycemic control but included in all other analyses.

Ethical Considerations
The study was conducted according to the Declaration of Helsinki and approved by the Ethics and Quality Assurance Committee of the University of the Mountains (CEAQ-UdM), registered under number 2024/065/UdM/PR/CEAQ. Written informed consent was obtained from all participants prior to enrollment. Participants were informed of the voluntary nature

of participation, confidentiality of responses, and their right to withdraw at any time without consequence to their medical care. [All data were anonymized and stored securely.] The following KAP survey evaluation grid was used to assess the knowledge, attitudes, and practices of the participants.[18]

KAP Evaluation Grid

Domain	Score Frequency (%)	Level of Appreciation
Knowledge	< 25%	Poor
	25–49%	Insufficient
	50–69%	Average
	≥ 70%	Good
Attitudes	< 25%	Harmful
	25–49%	Wrong
	50–69%	Approximate
	≥ 70%	Right
Practices	< 50%	Harmful
	50–69%	Inadequate
	≥ 70%	Adequate

RESULTS

Socio-demographic characteristics of the study population: A total of 229 participants were approached; 21 patients were excluded for three main reasons: diabetes diagnosis of less than three months, pregnancy, and withdrawal of consent during the interview. Responses from 208 patients were analyzed, among whom 183 (88.0%) were recruited at the National Center for Diabetology and Hypertension (NCDH) of Yaoundé Central Hospital and 25 (12.0%) at the Endocrinology Outpatient Department (EOD) of Yaoundé General Hospital. Figure 1 presents the flowchart of study population recruitment.

Flowchart of study population recruitment

Patients approached for eligibility
(n = 229)
↓
Excluded (n = 21)
· Diabetes diagnosis < 3 months
· Pregnancy
· Withdrawal of consent
↓
Included in the study
(n = 208)
↓
National Center for Diabetology and Hypertension (NCDH), Yaoundé Central Hospital
(n = 183)
↓
Endocrinology Outpatient Department (EOD), Yaoundé General Hospital
(n = 25)
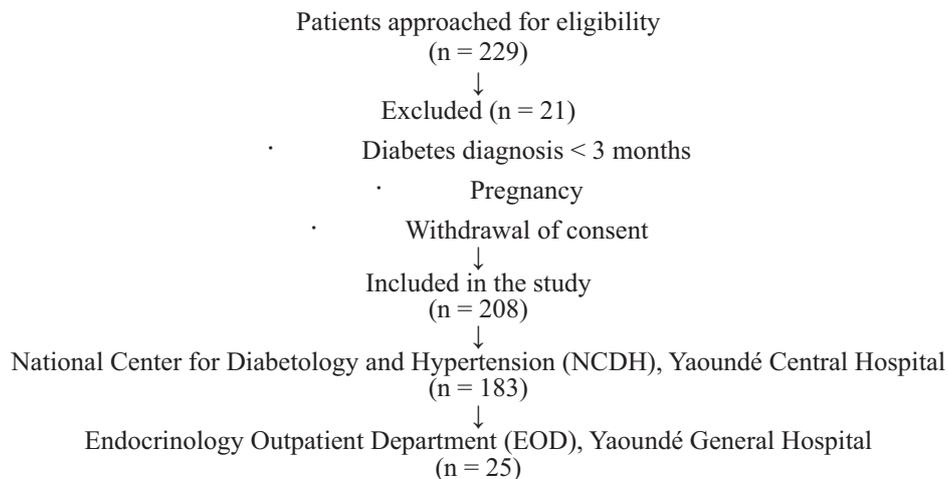
The mean age of the sample was 60 ± 11 years, and the male-to-female ratio was 1:2.15. Table 1 presents the socio-demographic characteristics of the participants.

Table 1: Socio-demographic characteristics of participants (N = 208)

| Variables	n	%
Age groups (years)		
< 40	9	4.3
40–59	77	37.0
60–79	114	54.8
≥ 80	8	3.8
Sex		
Male	66	31.7
Female	142	68.3
Level of education		
None	11	5.3
Primary	74	35.6
Secondary	75	36.1
University	48	23.1

Characteristics related to diabetes

A total of 208 diabetic patients comprised the sample. The median duration since diagnosis was 7 years (interquartile range: 3–13 years), with a minimum of 6 months and a maximum of 54 years. Characteristics related to diabetes are presented in Table 2.

Monthly income (FCFA)		
< 50,000	117	56.3
50,000–100,000	32	15.4
100,000–150,000	15	7.2
> 150,000	44	21.2
Residential area		
Urban	173	83.2
Rural	25	12.0
Semi-urban	10	4.8
Health insurance		
Yes	10	4.8
No	198	95.2

Comorbidities in the sample
The comorbidities found in the sample are shown in figure 2.
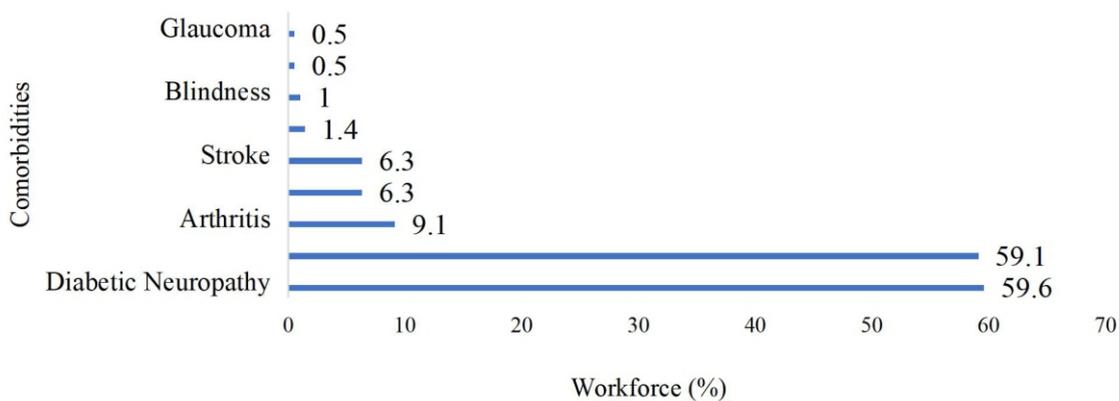
Figure 2: Distribution of comorbidities in the study population

Participants' knowledge of the relationship between diabetes and periodontal disease

The majority of participants (145, 69.7%) had a poor level of knowledge, 26 (12.5%) had average knowledge, 24 (11.5%) had insufficient knowledge, and only 13 (6.3%) demonstrated good knowledge.

Table 3 presents participants' responses regarding knowledge of the relationship between diabetes and periodontal disease.

Table 3: Participants' knowledge of the relationship between diabetes and periodontal disease (N = 208)

Variables	n	%
Have you ever heard about the relationship between diabetes and periodontal disease?		
Yes	21	10.1
No	187	89.9
Information channels (n = 21)*		
Radio/Television	1	4.8
Internet	1	4.8
Doctor	8	38.1
Dentist	11	52.4
Others	1	4.8
Can diabetes affect your gums?		
Yes	60	28.8
No	23	11.1
I don't know	125	60.1

Can diabetes increase the risk of developing gum problems?		
Yes	38	18.3
No	29	13.9
I don't know	141	67.8
Can treatment of bleeding gums improve blood sugar/glycemic control?		
Yes	28	13.5
No	38	18.3
I don't know	142	68.3
In your opinion, how often should diabetics visit the dentist?		
Once a year	17	8.2
Twice a year	18	8.7
Three times a year	6	2.9
In case of problem	77	37.0
I don't know	90	43.3
*Multiple responses possible		

Attitudes towards dental consultations and dental care

Regarding level of attitude, 124 participants (59.6%) had an approximate attitude, 53 (25.5%) had a wrong attitude, 26 (12.5%) had a right attitude, and 5 (2.4%) had a harmful attitude.
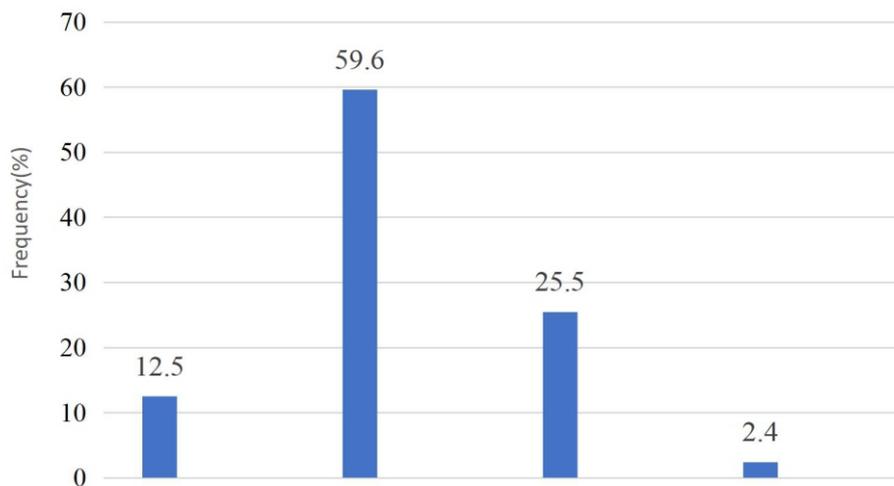
Figure 3: Level of attitudes in study population (Right-Approximate-Wrong-Harmful

Table 4: Participants' responses about attitudes towards dental consultations and dental care

Variables	n	%
Have you ever visited a dentist?		
Yes	**121**	**58.2**
No	**87**	**41.8**
What situation(s) led you to consult a dentist?*		
Pain	**189**	**90.9**
Routine visit/Check-up	**10**	**4.8**
Bad breath	**20**	**9.6**
Tooth decay	**41**	**19.7**
Bleeding gums	**29**	**13.9**
Dental mobility	**30**	**14.4**
Last dental visit (n = 121)		
Less than 6 months	**14**	**11.6**
6 months to 1 year	**13**	**10.7**
1 to 2 years	**23**	**19.0**
More than two years	**71**	**58.7**
Do you specify your diabetic status before dental care? (n = 121)		

Yes	112	92.6
No	8	6.6
Sometimes	1	0.8
Are you ready to learn more about gum disease?		
Yes	205	98.6
No	3	1.4
*Multiple responses possible		

Participants' practices regarding oral hygiene habits

Regarding the level of oral hygiene practices, 118 participants (56.7%) had inadequate practices, 65 (31.3%) had adequate practices, and 25 (12.0%) had harmful practices.

Table 5 presents participants' responses regarding their oral hygiene habits.

Table 5: Participants' oral hygiene practices (N = 208)

Variables	n	%
Brushing equipment*		
Manual toothbrush only	19	9.1
Toothbrush and fluoride toothpaste	169	81.2
Toothbrush and soap	3	1.4
Manual toothbrush and charcoal/ash	1	0.5
Manual toothbrush and salt	8	3.8
Manual toothbrush and baking soda	8	3.8
Toothbrush type (bristles)		
Soft	126	60.6
Medium	66	31.7
Hard	16	7.7
Brushing time		
Morning before eating only	29	13.9
Morning after eating only	2	1.0
Evening after meals only	3	1.4
Morning after eating and evening before bed	21	10.1
Morning before eating and evening before bed	153	73.6
Use of interdental cleaning tools		
Dental floss		
Yes	58	27.9
No	150	72.1
Use a toothpick		
Yes	165	79.3
No	43	20.7
*Multiple responses possible		

Factors associated with inadequate practices

Table 6 presents the factors associated with inadequate oral hygiene practices.

Table 6: Factors associated with inadequate practices (N = 208)

Variables	p-value	ORr (95% CI)	Adjusted p-value	ORa (95% CI)
Age (<40 years)	0.028	0.21 (0.05–0.97)	0.63	0.64 (0.10–4.01)
Age (60–80 years)	0.022	1.99 (1.10–3.61)	0.06	1.88 (0.96–3.66)
Level of education (primary)	0.004	2.63 (1.33–5.19)	0.85	0.86 (0.16–4.56)
Level of education (university)	0.001	0.35 (0.17–0.67)	0.01	0.36 (0.15–0.83)
Income (<50,000 FCFA)	0.048	1.81 (1.01–3.28)	0.79	0.91 (0.43–1.80)
Marital status (single)	0.009	0.29 (0.11–0.76)	0.17	0.45 (0.14–1.40)
Poor knowledge	0.001	3.31 (1.62–6.79)	**0.04**	**2.21 (1.98–4.95)**
Approximate attitudes	0.017	2.40 (1.15–5.02)	**0.01**	**2.87 (1.25–6.62)**

ORr: Raw odds ratio; ORa: Adjusted odds ratio (all factors were included in the logistic regression model); CI: Confidence interval.

DISCUSSION

Findings: This study highlights the educational needs of Cameroonian type 2 diabetics (T2D) regarding periodontal health. The findings underscore the importance of monitoring HbA1c levels during periodontal follow-up.[3,6,7] Considering Caton's classification,[3] our study revealed that 35.1% of participants had uncontrolled diabetes (HbA1c ≥7%), and 23.1% were not monitored. HbA1c, a key circulating marker of average blood glucose levels over the preceding three months, is now considered in the diagnosis of periodontitis and correlates with the risk of periodontitis progression. [3, 7] However, this threshold may be adapted to individual patients by endocrinologists.[6]

The overall level of knowledge was poor. The majority of participants (89.9%) reported being unaware of the relationship between diabetes and periodontal disease. Our results are similar to those reported by Nigerian authors who, in a study of 152 T2D patients, found that 69.7% were unaware of this relationship.[19] Few participants (28.8%) acknowledged that diabetes could affect the gums. Our findings differ from previous studies;[20,21] Ikimi et al. reported that only 4.6% of diabetics were informed about the impact of diabetes on the gums,[20] while Kirti et al. found that nearly half (49.2%) were informed.[21] These discrepancies may be explained by differences in recruitment settings: Kirti's study recruited from dental clinics, whereas Ikimi's study and ours recruited from diabetes management clinics. The hypothesis is that patients followed in dental settings may receive more targeted information. Indeed, we found that dentists were the primary information providers and that 58.2% of participants had consulted a dentist, compared to 2.3% in Ikimi's study. Another study demonstrated that diabetics who regularly consult a dentist are more aware of their periodontal risk compared to those who do not.[19]

These results highlight the need to further sensitize Cameroonian diabetics about the bidirectional link between diabetes and periodontal disease. The conclusions of the workshop jointly organized by the European Federation of Periodontology (EFP) and the International Diabetes Federation (IDF) support this direction;[6] strong recommendations were issued regarding oral health education for diabetics as part of their comprehensive educational program, including informing them about their increased risk of periodontal disease, glycemic imbalance, and cardiovascular and renal complications in the absence of periodontal treatment. Diabetic patients should also be informed of the beneficial effect of periodontal treatment on diabetes control.

In this study, 59% of participants demonstrated approximate attitudes. Although more than half of diabetics (58.2%) reported having consulted a dentist, 90% of these consultations were pain-driven, with only 4.8% mentioning preventive dental visits, and 41.8% had never consulted a dentist. Oral pain is the most common reason for dental consultations and is frequently attributable to dental caries and its complications. Excluding emergencies such as necrotizing periodontal disease, periodontal abscess, or septum syndrome, periodontal disease typically develops silently and painlessly. However, suggestive signs—including gingival tension, halitosis, gingival redness or swelling, bleeding gums, tooth loosening, mobility, and spontaneous tooth loss—should prompt diabetic patients to seek dental care.[6]

Our results align with a 2017 Nigerian study where 49% of diabetics had never consulted a dentist, and 61.8% were unaware of the importance of dental consultations.[19] Nevertheless, the majority of patients expressed willingness to receive more information. An Australian study reported that 59.4% of dental consultations among diabetics were motivated by dental problems and treatments.[22] Scientific societies and associations, including the EFP, the French Federation of Diabetes (FFD), and the American Diabetes Association (ADA), recommend that diabetics consult a dentist at least once annually as part of diabetes management, even in the absence of symptoms.[6,23,24]

Regarding oral hygiene practices, 56% of participants demonstrated inadequate practices. Although 80% reported brushing with a manual toothbrush and toothpaste, only 10% reported brushing in the morning after eating and in the evening before bed. Additionally, 79% used toothpicks for interdental cleaning, while 27% used dental floss. These findings are consistent with Onigbinde et al., where 58.6% of diabetics used toothpicks and 11.8% used dental floss.[19] However, our results differ from Kirti et al., where the majority (92%) did not use interdental cleaning tools.[21] This study suggests that interdental cleaning with dental floss is not a common practice among Cameroonian diabetics. Current recommendations include twice-daily brushing (morning and evening after meals) for two minutes with a soft-bristled manual or electric toothbrush, along with interdental cleaning using appropriate tools such as interdental brushes, sticks, or dental floss based on clinical presentation.[6,23,24]

Multivariate analysis revealed that poor knowledge and approximate attitudes were independently associated with inadequate practices (OR = 2.2 and OR = 2.8, respectively). Conversely, participants with university education were less likely to engage in inadequate practices (OR = 0.36). These findings align with Hasan et al., who, in a multicenter study of 379 T2D patients, found a significant association between knowledge, attitudes, and practices regarding oral hygiene and the severity of periodontal disease.[25]

Implications: Prevention and promotion of oral and periodontal health during diabetes monitoring—including awareness of periodontal diseases, oral hygiene education, preventive dental consultations, and periodontal screening—would contribute to optimizing healthcare for Cameroonian type 2 diabetics and reducing the morbidity and mortality burden associated with these two chronic diseases in our country.

Trade-Offs (Limitations): This study was conducted among a hospital-based population of diabetics in an urban area. It would be valuable to conduct similar studies in other regions of Cameroon and to recruit participants outside hospital settings to enhance generalizability.

Take-Home (Conclusion): The majority of participants demonstrated poor knowledge of the relationship between diabetes and periodontal disease, approximate attitudes toward dental consultations and oral care, and inadequate oral hygiene practices. There is an urgent need for further education on the interrelationship between type 2 diabetes and periodontal disease, to modify attitudes and behaviors regarding preventive consultations, and to optimize oral hygiene practices among this population.

Expectations for Future Research: Future studies should explore the impact of preventive measures and periodontal health promotion on the periodontal status of diabetic patients.

Recommendations We recommend that physicians, endocrinologists, and other healthcare professionals responsible for diabetes care, as well as the Ministry of Public Health, incorporate oral hygiene education, preventive consultations, and periodontal screening for Cameroonian diabetics as part of a national comprehensive care program. Furthermore, diabetics must be informed about their periodontal risk and the positive impact of good oral hygiene habits and periodontal treatment on both oral health and diabetes control.

Conflicts of Interest: The authors declare no conflicts of interest.

REFERENCES

1. Petersmann A, Müller-Wieland DA, Müller U, Landgraf R, Nauck M, Freckmann G, et al. Definition, classification and diagnosis of diabetes mellitus. Exp Clin Endocrinol Diabetes. 2019;127(Suppl 1):S1-7.

2. International Diabetes Federation. Cameroon [Internet]. Brussels: IDF; c2025 [cited 2025 Aug 16]. Available from: https://idf.org/our-network/regions-and-members/africa/members/cameroon/

3. Caton JG, Armitage G, Berglundh T, Chapple ILC, Jepsen S, Kornman KS, et al. A new classification scheme for periodontal and peri-implant diseases and conditions - introduction and key changes from the 1999 classification. J Clin Periodontol. 2018;45(Suppl 20):S1-8.

4. Lang NP, Bartold PM. Periodontal health. J Periodontol. 2018;89(Suppl 1):S9-16.

5. Belinga LEE, Ngan WB, Lemougoum D, Nlo'o ASPE, Bongue B, Ngono A, et al. Association between periodontal diseases and cardiovascular diseases in Cameroon. J Public Health Afr. 2018;9:761.

6. Sanz M, Ceriello A, Buysschaert M, Chapple I, Demmer RT, Graziani F, et al. Scientific evidence on the links between periodontal diseases and diabetes: consensus report and guidelines of the joint workshop on periodontal diseases and diabetes by the International Diabetes Federation and the European Federation of Periodontology. Diabetes Res Clin Pract. 2018;137:231-41.

7. Cherakoui S, Chevalier G, Veyrie CJ. Diabète et maladies parodontales: état des connaissances et recommandations pour la prise en charge parodontale du patient diabétique. Aonews-lemag [Internet]. 2022 [cited 2025 Aug 16]. Available from: https://www.aonews-lemag.fr/diabete-maladies-parodontales-aonews/

8. Genco RJ, Borgnakke WS. Diabetes as a potential risk for periodontitis: association studies. Periodontol 2000. 2020;83(1):40-5.

9. Nascimento GG, Leite FRM, Vestergaard P, Scheutz F, Lopez R. Does diabetes increase the risk of periodontitis? A systematic review and meta-regression analysis of longitudinal prospective studies. Acta Diabetol. 2018;55:653-67.

10. Wu CZ, Yuan YH, Liu HH, Li SS, Zhang BW, Chen W, et al. Epidemiologic relationship between periodontitis and type 2 diabetes mellitus. BMC Oral Health. 2020;20(1):204.

11. Stöhr J, Barbaresko J, Neuenschwander M, Schlesinger S. Bidirectional association between periodontal disease and diabetes mellitus: a systematic review and meta-analysis of cohort studies. Sci Rep. 2021;11(1):13686.

12. Kocher T, König J, Borgnakke WS, Pink C, Meisel P. Periodontal complications of hyperglycemia/diabetes mellitus: epidemiologic complexity and clinical challenge. Periodontol 2000. 2018;78(1):59-97.

13. Löe H. Periodontal disease: the sixth complication of diabetes mellitus. Diabetes Care. 1993;16(1):329-34.

14. Chen YF, Zhan Q, Wu CZ, Yuan YH, Chen W, Yu FY, et al. Baseline HbA1c level influences the effect of periodontal therapy on glycemic control in people with type 2 diabetes and periodontitis: a systematic review on randomized controlled trials. Diabetes Ther. 2021;12:1249-78.

15. Essama Eno Belinga L, Bell Ngan W, Kouotou Mouliom JS, Choukem SP. Évaluation de la santé bucco-dentaire des patients diabétiques Camerounais. Health Sci Dis. 2013;14(3):1-5.

16. Essama Eno Belinga L, Mbango Ekouta ND, Nokam Abena E, Essam Nloo AP, Bell Ngan W, Abanda Dang G, et al. Periodontitis increases risk of peripheral arterial occlusive disease in diabetic subjects living in Cameroon. Dent Res Oral Health. 2020;3(3):153-61.

17. Tsobgny-Tsague NF, Lontchi-Yimagou E, Nana ARN, Tankeu AT, Katte JC, Dehayem MY, et al. Effects of nonsurgical periodontal treatment on glycated haemoglobin on type 2 diabetes patients (PARODIA 1 study): a randomized controlled trial in a sub-Saharan Africa population. BMC Oral Health. 2018;18(1):28.

18. Essi MJ, Njoya O. L'enquête CAP en recherche médicale. Health Sci Dis [Internet]. 2013 [cited 2026 Jan 15];14(2). Available from: https://www.hsd-fmsb.org/index.php/hsd/article/view/183

19. Onigbinde OO, Dosumu EB, Oyapero AA. Oral health-related awareness, practices (attitude) and determination of the level of awareness of periodontal disease risk among diabetic patients. Nig Dent J. 2017;25:313-20.

20. Ikimi NU, Edomwonyi AI, Oguntimehin IA, Dahusi MD. Oral health knowledge and attitude of diabetic patients in Lagos State University Teaching Hospital, Lagos State. Nig J Dent Res. 2017;2(1):43-8.

21. Kirti AS, Girish S, Siddhartha V, Sameer Z. Two way relationship between diabetes and periodontitis: a cross-sectional survey of knowledge, awareness, and attitude. Int J Pharm Res Allied Sci. 2022;11(2):1-7.

22. Poudel P, Griffiths R, Arora A, Wong VW, Flack JR, Barker G, et al. Oral health status, knowledge, and behaviors of people with diabetes in Sydney, Australia. Int J Environ Res Public Health. 2021;18(7):3464.

23. French Federation of Diabetics. Comprendre le diabète [Internet]. Paris: FFD; c2025 [cited 2025 Mar 24]. Available from: https://www.federationdesdiabetiques.org

24. French Society of Periodontology and Oral Implantology. Parodontopathies et diabète: recommandations pour la pratique clinique [Internet]. Paris: SFPIO; c2025 [cited 2025 Mar 24]. Available

25. American Diabetes Association Professional Practice Committee. 4. Comprehensive medical evaluation and assessment of comorbidities: standards of care in diabetes-2025. Diabetes Care. 2025;48(Suppl 1):S59-85.

26. Hasan SMM, Rahman M, Nakamura K, Tashiro Y, Miyashita A, Seino K. Relationship between diabetes self-care practices and control of periodontal disease among type 2 diabetes patients in Bangladesh. PLoS One. 2021;16:e0249011.