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Periodontal status of hypertensive patients in hospital settings in Kinshasa

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ABSTRACT

Introduction
Periodontal disease may contribute to the development or aggravation of high blood pressure (HBP). Conversely, hypertension increases susceptibility to periodontal deterioration. Despite the high prevalence of hypertension in the Congolese population, no periodontal profile of Congolese adults with hypertension has yet been established.

Purpose
This study aimed to describe the periodontal status of hypertensive patients receiving care in hospitals in Kinshasa and to identify associated factors.

Methods
A cross-sectional study was conducted from November 2023 to May 2024 in two medical institutions in Kinshasa. Patients aged ≥18 years with diagnosed hypertension who provided informed consent were included. Patients with prior periodontal treatment, leukaemia, pregnancy, or diabetes were excluded. A single trained and calibrated examiner collected demographic, clinical, and periodontal data. Statistical analyses were performed using IBM SPSS Statistics version 20.0. The chi-square test and multinomial regression analysis were applied to determine factors associated with periodontal status. Statistical significance was set at $p < .05$.

Results
A total of 227 hypertensive patients with a mean age of 57.9 ± 11.5 years participated in the study. Periodontal disease was present in 93.8% of participants. Age was identified as an independent predictor of severe periodontitis (OR = 17.86; 95% CI [3.58–89.07]). Duration of hypertension independently predicted both moderate and severe periodontitis. Patients with hypertension lasting at least four years showed an increased risk of moderate periodontitis (OR = 8.02; 95% CI [1.37–47.06]) and severe periodontitis (OR = 10.05; 95% CI [1.75–57.65]). Gingivitis was not significantly associated with periodontal disease severity.

Conclusion
Hypertensive patients demonstrated a high prevalence of periodontal disease. These findings support the integration of oral health assessment, particularly periodontal screening, into routine hypertension management.

INTRODUCTION

Periodontal health refers to the absence of inflammation, infection, or destruction of the supporting tissues responsible for maintaining tooth stability and function. In contrast, periodontal disease (PD) is a chronic inflammatory condition of infectious origin affecting these supporting structures, leading to partial or complete tissue destruction. Periodontal disease generally progresses through two consecutive clinical stages: gingivitis, a reversible inflammation of the gingiva, and periodontitis, an irreversible condition characterised by destruction of periodontal tissues (Lang et al., 2018; Mehrotra et al., 2023). In the Democratic Republic of the Congo (DRC), the prevalence of gingivitis has been reported to be as high as 99%, while periodontitis affects approximately 40%–64% of the population (Bolenge et al., 2018; Kalala et al., 2021). Periodontal disease shares numerous risk factors with cardiovascular diseases, including hypertension. Hypertension (HTN) is estimated to account for approximately eight million deaths annually and more than 100 million cases of disability worldwide. In the DRC, reported prevalence rates of hypertension range between 15.23% and 30.9% (Angendu et al., 2024; Musung et al., 2021).

Growing evidence suggests that the impact of periodontitis extends beyond the oral cavity. Several studies have demonstrated associations between periodontal disease and cardiovascular conditions, particularly hypertension. Local inflammation associated with periodontal disease may significantly contribute to systemic inflammatory responses through the release of pro-inflammatory mediators. These mediators promote endothelial dysfunction and may contribute to the development or exacerbation of hypertension. Conversely, hypertension may induce microangiopathic vascular changes that compromise blood supply to periodontal tissues, thereby increasing susceptibility to inflammation and periodontal destruction (Del Pinto et al., 2019; Muñoz et al., 2021).

Hypertensive patients are therefore particularly vulnerable and at increased risk of both systemic and oral complications, warranting special clinical attention. Despite this, no study has specifically assessed the periodontal status of hypertensive patients attending hospital settings in Kinshasa. Evaluating their periodontal profile is essential for preventing periodontal complications and optimising overall health management. Accordingly, this study aimed to describe the periodontal status of hypertensive patients receiving care in hospitals in Kinshasa and to investigate factors associated with periodontal disease severity.

METHODS

Study Area

This study was conducted in the internal medicine departments of two medical institutions in Kinshasa: the N'djili General Reference Hospital and the Biopharm Medical Center.

The N'djili General Reference Hospital is located in the commune of N'djili within the Tshangu district, whereas the Biopharm Medical Center is situated in the commune of Kinshasa in the Funa district. Both institutions provide multidisciplinary clinical and diagnostic services and are recognised for comprehensive management of hypertensive patients delivered by qualified healthcare specialists.

Study Design

A hospital-based cross-sectional study was conducted over a seven-month period from November 2023 to May 2024.

Study Population and Sampling Technique

Participants were recruited using a convenience sampling method, including patients who were present and available in the selected hospitals during the study period. Eligible participants were adults aged ≥18 years with a confirmed diagnosis of hypertension, complete medical records, attendance on the day of periodontal examination, and provision of written informed consent. Patients who had received periodontal treatment within six months prior to data collection or those presenting with systemic conditions known to affect periodontal status were excluded.

Administrative authorisation was obtained from the Chief Medical Officers of both hospitals prior to commencement of the study. The study procedures were explained to hospital authorities and eligible participants.

Clinical Examination and Data Collection

Demographic and clinical information, including age, sex, and hypertension grade, was obtained from patients' medical records. Blood pressure was measured on the day of examination using a Spengler Tensonic electronic blood pressure monitor (Spengler, France), validated for clinical use.

A comprehensive periodontal examination was performed to assess periodontal parameters, including periodontal pocket depth, clinical attachment loss, dental plaque, and bleeding on probing.

Periodontal pocket depth (PPD) and clinical attachment loss (CAL) were measured at six sites per tooth using a Williams periodontal probe. Ramfjord index teeth (16, 21,

24, 36, 41, and 44) were used to assess plaque index and bleeding index (O'Leary et al., 1972). All clinical measurements were performed by a single trained and calibrated examiner.

Definitions of periodontal parameters were as follows:

- **Periodontal Pocket Depth (PPD):** Distance from the gingival margin to the base of the gingival sulcus or periodontal pocket.
- **Clinical Attachment Loss (CAL):** Distance from the cementoenamel junction to the base of the periodontal pocket.
- **Plaque Index (PI):** Scoring index used to assess the presence of dental plaque on tooth surfaces.
- **Bleeding on Probing (BOP):** Presence of gingival bleeding following gentle periodontal probing.

Data Reliability and Validity

To ensure measurement consistency, intra-examiner reliability was assessed before and during the study through repeated periodontal examinations in 10% of participants. The intraclass correlation coefficient (ICC) was calculated to evaluate agreement and reproducibility. An ICC value of 0.92 (95% CI: 0.85–0.96) indicated excellent reliability, confirming high consistency of measurements.

Data Analysis

Data were entered into Microsoft Excel 2016 and analysed using IBM SPSS Statistics version 20.0.

Quantitative variables were summarised using means and standard deviations, depending on data distribution. Qualitative variables were presented as frequencies and percentages. The chi-square test was used to evaluate associations between demographic and clinical variables and periodontal status. Statistical significance was set at $p < .05$.

Ethical Considerations

The study protocol was approved by the Ethics Committee of the Faculty of Dental Medicine, University of Kinshasa. All procedures were conducted in accordance with the principles of the Declaration of Helsinki.

All data were anonymised to ensure participant confidentiality. Written informed consent was obtained from all participants prior to enrolment. Participants received detailed explanations regarding study objectives, procedures, potential risks, and benefits and were free to participate voluntarily or withdraw at any stage without consequence.

RESULTS

Characteristics of the Study Population

Table 1:
Sociodemographic and Clinical Characteristics of the Study Population (N = 227)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	< 50	57	25.1
	≥ 50	170	74.9
Sex	Male	108	47.6
	Female	119	52.4
Duration of Hypertension	< 4 years	110	48.5
	≥ 4 years	117	51.5
Hypertension Control	Controlled	59	26.0
	Uncontrolled	168	74.0

Table 1 shows a slightly higher proportion of female hypertensive patients. The majority of participants were aged ≥50 years (74.9%), with a mean age of **57.9 ± 11.5 years**. Most patients presented with uncontrolled hypertension (74%). Slightly more than half of the participants (51.5%) had been hypertensive for at least four years.

Periodontal Parameters

Table 2:
Periodontal Clinical Parameters of the Study Population

Parameter	Mean ± SD	Range
Periodontal Pocket Depth (PPD), mm	5.5 ± 1.2	4–11
Clinical Attachment Loss (CAL), mm	2.5 ± 1.2	1–8
Plaque Index (PI), %	75.5 ± 25.8	12.5–100
Bleeding on Probing (BOP), %	72.3 ± 28.5	0–100

Abbreviations: PPD = periodontal pocket depth; CAL = clinical attachment loss; PI = plaque index; BOP = bleeding on probing.

Hypertensive patients demonstrated poor periodontal conditions overall. The mean plaque index was **75.5 ± 25.8%**, while the mean bleeding on probing score was **72.3 ± 28.5%**. The mean periodontal pocket depth was **5.5 ± 1.2 mm**, indicating substantial periodontal tissue involvement.

Distribution of Periodontal Status

Figure 1:
Distribution of Participants According to Periodontal Status

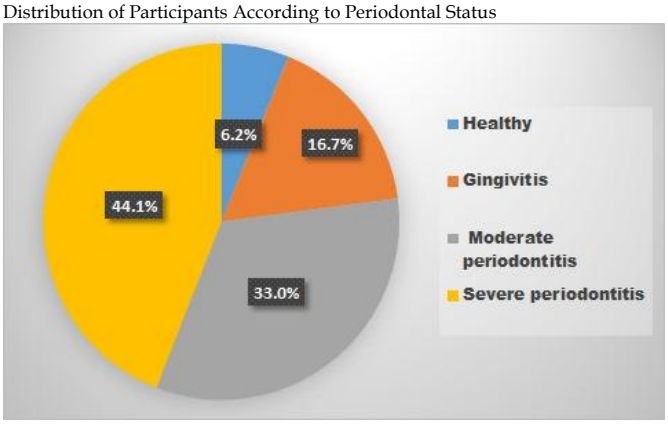

Figure 1 shows that **93.8**% of participants presented with periodontal disease. Periodontitis was observed in **77.1**% of patients, while **16.7**% had gingivitis. Only **6.2**% of participants were periodontally healthy.

Association Between Periodontal Status and Patient Characteristics

Table 3:
Association Between Periodontal Status and Demographic and Hypertension-Related Variables

Variable	Healthy n (%)	Gingivitis n (%)	Moderate Periodontitis n (%)	Severe Periodontitis n (%)	χ^2	*p*
Age					15.676	.001*
< 50 years	9 (15.8)	9 (15.8)	22 (38.6)	17 (29.8)		
≥ 50 years	5 (2.9)	29 (17.1)	53 (31.2)	83 (48.8)		
Sex					5.257	.154
Male	5 (4.6)	21 (19.4)	29 (26.9)	53 (49.1)		
Female	9 (7.6)	17 (14.3)	46 (38.7)	47 (39.5)		
Duration of Hypertension					9.291	.026*
< 4 years	11 (9.7)	23 (20.4)	30 (26.5)	49 (43.4)		
≥ 4 years	3 (2.6)	15 (13.2)	45 (39.5)	51 (44.7)		
Hypertension Control					10.187	.017*
Controlled	5 (8.5)	17 (28.8)	14 (23.7)	23 (39.0)		
Uncontrolled	9 (5.4)	21 (12.5)	61 (36.3)	77 (45.8)		

Significant at p < .05.

Table 3 demonstrates that periodontal disease severity was significantly associated with **age** (p = .001), **duration of hypertension** (p = .026), and **hypertension control status** (p = .017). No statistically significant association was observed between periodontal status and sex.

Independent Determinants of Periodontal Status

Table 4:
Multinomial Logistic Regression Analysis of Independent Determinants of Periodontal Status

Periodontal Status	Variable	Category	*p*	Adjusted OR	95% CI
Severe Periodontitis	Age	≥50 years	<.001*	17.86	3.58–89.07
		<50 years	Reference	–	–
	Duration of Hypertension	≥4 years	.021*	8.02	1.37–47.06
		<4 years	Reference	–	–
	Hypertension Control	Uncontrolled	.108	3.97	0.74–21.39
		Controlled	Reference	–	–
Moderate Periodontitis	Age	≥50 years	.062	4.18	0.93–18.73
	Duration of Hypertension	≥4 years	.010*	10.05	1.75–57.65
	Hypertension Control	Uncontrolled	.091	4.18	0.80–21.93
Gingivitis	Age	≥50 years	.719	1.35	0.27–6.81
	Duration of Hypertension	≥4 years	.162	3.67	0.59–22.72
	Hypertension Control	Uncontrolled	.080	0.14	0.02–1.26

Significant at p < .05.

Table 4 indicates that **age ≥50 years** was a strong independent predictor of severe periodontitis (OR = 17.86; 95% CI [3.58–89.07]). Duration of hypertension independently predicted both moderate and severe periodontitis. Patients with hypertension lasting at least four years demonstrated increased odds of moderate periodontitis (OR = 10.05; 95% CI [1.75–57.65]) and severe periodontitis (OR = 8.02; 95% CI [1.37–47.06]).

No independent association was observed between gingivitis and the evaluated predictors.

DISCUSSION

The aim of this study was to describe the periodontal profile of hypertensive patients receiving care in hospital settings in Kinshasa.

Periodontal Status

In the present study, the majority of hypertensive patients presented with severe periodontitis (44.1%). This finding is consistent with the results reported by Könnecke et al. (2022). Similarly, Zhan et al. (2022) demonstrated that severe periodontitis (Stages III and IV) was more prevalent among hypertensive patients compared with normotensive individuals.

These findings further support the established association between periodontal disease (PD) and hypertension (HTN), which may be explained by shared risk factors and underlying inflammatory mechanisms. Inflammatory biomarkers appear to play a central role in the interaction between periodontal disease and hypertension. Elevated levels of C-reactive protein (CRP) and pro-inflammatory cytokines, particularly interleukin-1 (IL-1) and interleukin-6 (IL-6), contribute to systemic inflammatory burden in both conditions. CRP reflects persistent low-grade inflammation, whereas IL-1 and IL-6 directly participate in periodontal tissue destruction and endothelial dysfunction. Sustained elevation of these mediators may therefore aggravate periodontal breakdown while simultaneously promoting the progression or poor control of hypertension, suggesting a shared inflammatory pathway linking the two diseases (Szczepaniak et al., 2021).

Periodontal Parameters

The findings of this study indicate elevated periodontal parameters among hypertensive patients. Comparable

results were reported by Yang et al., who observed significantly higher periodontal indices in hypertensive individuals than in normotensive controls. Likewise, Pavalan et al. (2025) and Zhan et al. (2023) reported increased bleeding on probing among hypertensive patients.

These elevated periodontal parameters reinforce the concept of a bidirectional relationship between hypertension and periodontal disease, highlighting the potential impact of systemic vascular conditions on periodontal health.

A systematic review by Muñoz Aguilera et al. (2020) demonstrated a clear association between periodontitis and hypertension. Periodontal inflammation may trigger systemic inflammatory responses that promote endothelial dysfunction, thereby contributing to the development or worsening of hypertension. Conversely, hypertension may impair periodontal microcirculation, reducing tissue defence capacity and increasing susceptibility to periodontal destruction (Nabila et al., 2023).

Association Between Hypertension and Related Factors

Age is a well-established determinant of cardiovascular disease, with prevalence increasing markedly with advancing age. Age also substantially modifies both cardiovascular risk attributable to blood pressure and susceptibility to periodontal disease (Muñoz Aguilera et al., 2021; Yang et al., 2025).

In the present study, a significant association was observed between age and severity of periodontitis. Patients aged ≥50 years exhibited more severe periodontal disease compared with younger individuals ($p < .001$; OR = 17.86; 95% CI [3.58–89.07]). Similar associations between increasing age and periodontal disease severity have been reported elsewhere (Nazir et al., 2020; Yang et al., 2025). This relationship may reflect cumulative exposure to bacterial plaque, chronic inflammation, and age-related alterations in immune response and tissue regenerative capacity (Shan et al., 2025).

Multivariate analysis did not demonstrate a significant association between hypertension control and severe periodontitis ($p = .108$). Comparable findings were reported by Chen et al. (2023). However, Del Pinto et al. (2021) identified a significant association, suggesting that this relationship may vary across populations and methodological approaches.

Patients with hypertension duration of four years or longer showed a significantly higher prevalence of periodontal disease ($p = .026$; OR = 8.02; 95% CI [1.37–47.06]). This finding suggests that chronic exposure to elevated blood pressure may exacerbate periodontal inflammation and accelerate tissue destruction. Similar observations were reported by Zhan et al., who demonstrated a strong association between prolonged hypertension and increased severity of periodontitis in a Chinese population. In contrast, Pogodina et al. (2019) reported no significant relationship between hypertension duration and periodontal status in a Russian cohort. Such discrepancies may be attributable to differences in demographic characteristics, behavioural factors, and epidemiological contexts.

Although chi-square analysis demonstrated a significant association between periodontal disease severity and hypertension control ($p = .017$), this association was not retained in multivariable regression analysis, suggesting possible confounding effects. Muñoz et al. (2021) reported that periodontitis was independently associated with higher mean systolic blood pressure and increased odds of systolic blood pressure ≥140 mmHg (OR = 2.3; 95% CI [1.15–4.60]; $p = .018$), even after adjustment for cardiovascular risk factors.

In the present study, gingivitis was not significantly associated with hypertension, which aligns with several studies primarily linking hypertension with periodontitis rather than gingivitis alone (Arshad et al., 2024). However, Liu et al. (2023), using Mendelian randomisation analysis, demonstrated a bidirectional causal relationship between hypertension and gingival bleeding. Differences in findings may be explained by variations in study design and analytical methodology.

Limitations of the Study

The principal limitation of this study was the relatively modest sample size, partly resulting from refusal of participation by some eligible individuals. Nevertheless, the study provides valuable epidemiological evidence regarding the relationship between periodontal disease and hypertension among Congolese adults, a population for which data remain limited.

CONCLUSION

Periodontal disease was highly prevalent among hypertensive patients in this study population. Increasing age and longer duration of hypertension were significantly associated with greater periodontal disease severity.

These findings highlight the importance of integrated clinical management involving both periodontists and cardiologists to improve early detection, optimise blood pressure control, and potentially reduce morbidity associated with hypertension.

Recommendations

1. Strengthening interdisciplinary collaboration between cardiologists and periodontists to facilitate early identification of severe periodontitis and improve hypertension monitoring and control.
2. Implementation of regular periodontal assessment for elderly patients with long-standing or poorly controlled hypertension.
3. Integration of periodontal evaluation and care into routine management of hypertensive patients.
4. Continuous professional education of cardiologists regarding the relationship between periodontal and cardiovascular diseases to enhance patient awareness and preventive care.

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Ethical Approval: The study protocol was approved by the Ethics Committee of the Faculty of Dental Medicine, University of Kinshasa. All procedures were conducted in accordance with the principles of the Declaration of Helsinki..

Conflicts of Interest: None declared.

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REFERENCES

Angendu, K. B., Akilimali, P. Z., Tran, N. T., & Magne, J. (2024). Dynamic progression of hypertension and diabetes in the Democratic Republic of Congo from 2019 to 2023. *Journal of Clinical Medicine, 13*(18), 5488. https://doi.org/10.3390/jcm13185488

Arshad, S., Awang, R. A., Rahman, N. A., Hassan, A., Ahmad, W. M. A. W., Mohamed, R. N., Basha, S., & Karobari, M. I. (2024). Assessing the impact of systemic conditions on periodontal health in the Malaysian population: A retrospective study. *BMC Oral Health, 24*(1), 1330. https://doi.org/10.1186/s12903-024-05102-y

Bolenge, I. J., Lutula, P. N., Bieleli, E. I., Nswele, V., Sekele, I. J. P., Matanda, R., Mapatano, M. A., & Brecx, M. C. (2016). Évaluation de la santé parodontale des Congolais admis en consultation dentaire dans la ville de Kinshasa. *Odonto-Stomatologie Tropicale, 39*, 47–53.

Chen, Y., Zheng, J., Ni, D., Zhang, D., & Zhu, H. (2023). The correlation between periodontitis and uncontrolled hypertension is mediated by inflammatory markers: Results from a cross-sectional study of an urban elderly population in southeast China. *BMC Oral Health, 23*(1), 919. https://doi.org/10.1186/s12903-023-03680-x

Del Pinto, R., Pietropaoli, D., Muñoz-Aguilera, E., D'Aiuto, F., Czesnikiewicz-Guzik, M., Monaco, A., Guzik, T. J., & Ferri, C. (2020). Periodontitis and hypertension: Is the association causal? *High Blood Pressure & Cardiovascular Prevention, 27*(4), 281–289. https://doi.org/10.1007/s40292-020-00392-z

Del Pinto, R., Landi, L., Grassi, G., Sforza, N. M., Cairo, F., Citterio, F., Paolantoni, G., D'Aiuto, F., Ferri, C., Monaco, A., Pietropaoli, D., & Hy-Per Group. (2021). Hypertension and periodontitis: A joint report by the Italian Society of Hypertension (SIIA) and the Italian Society of Periodontology and Implantology (SIdP). *High Blood Pressure & Cardiovascular Prevention, 28*(5), 427–438. https://doi.org/10.1007/s40292-021-00466-6

Huang, D., Wang, Y., Li, B.-H., Wu, L., Xie, W.-Z., Zhou, X., & Ma, B. (2024). Association between periodontal disease and systemic diseases: A cross-sectional analysis of current evidence. *Military Medical Research, 11*, 74. https://doi.org/10.1186/s40779-024-00583-y

Kalala-Kazadi, E., Nyimi-Bushabu, F., Ntumba-Mulumba, H., & Brecx, M. C. (2021). Frequency and factors associated with periodontitis in Congolese patients: A cross-sectional study. *Open Journal of Stomatology, 11*(1), 55–64. https://doi.org/10.4236/ojst.2021.111005

Könnecke, H., Schnabel, R. B., Walther, C., Lamprecht, R., Heydecke, G., Seedorf, U., Jagodzinski, A., Borof, K., Zeller, T., Beikler, T., Smeets, R., Gosau, M., Behrendt, C.-A., Wenzel, U., Börschel, C. S., Karakas, M., Blankenberg, S., & Aarabi, G. (2022). Cross-sectional study on the association of periodontitis with arterial

hypertension in the Hamburg City Health Study. *European Journal of Medical Research, 27*(1), 181. https://doi.org/10.1186/s40001-022-00811-y

Lang, N. P., & Bartold, P. M. (2018). Periodontal health. *Journal of Periodontology, 89*(Suppl. 1), S9–S16. https://doi.org/10.1002/JPER.16-0517

Liu, S., Fu, L., Ye, B., Ao, M., Gosau, M., Friedrich, R. E., Smeets, R., Yan, M., Feng, H., Burg, S., & Feng, H. (2023). Association between hypertension and gingival bleeding: A two-sample Mendelian randomization study. *Research Square* (Preprint). https://doi.org/10.21203/rs.3.rs-3277110/v1

Mehrotra, N., & Singh, S. (2023). Periodontitis. In *StatPearls*. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK541126/

Muñoz Aguilera, E., Suvan, J., Buti, J., Czesnikiewicz-Guzik, M., Barbosa Ribeiro, A., Orlandi, M., Guzik, T. J., Hingorani, A. D., Nart, J., & D'Aiuto, F. (2020). Periodontitis is associated with hypertension: A systematic review and meta-analysis. *Cardiovascular Research, 116*(1), 28–39. https://doi.org/10.1093/cvr/cvz201

Muñoz Aguilera, E., Leira, Y., Miró Catalina, Q., Orlandi, M., Czesnikiewicz-Guzik, M., Guzik, T. J., Hingorani, A. D., Nart, J., & D'Aiuto, F. (2021). Is systemic inflammation a missing link between periodontitis and hypertension? Results from two large population-based surveys. *Journal of Internal Medicine, 289*(4), 532–546. https://doi.org/10.1111/joim.13180

Muñoz Aguilera, E., Suvan, J., Orlandi, M., Miró Catalina, Q., Nart, J., & D'Aiuto, F. (2021). Association between periodontitis and blood pressure highlighted in systemically healthy individuals: Results from a nested case-control study. *Hypertension, 77*(5), 1765–1774. https://doi.org/10.1161/HYPERTENSIONAHA.120.16790

Musung, J. M., Kakoma, P. K., Kaut Mukeng, C., Tshimanga, S. L., Munkemena Banze, J. P., Kaj, N. K., Kamuna, M. K., Mwamba, J. K., Nkulu, D. N., Katchunga, P. B., Mukuku, O., & Muyumba, E. K. (2021). Prevalence of hypertension and associated factors in Lubumbashi City, Democratic Republic of Congo: A community-based cross-sectional study. *International Journal of Hypertension, 2021*, 1–8. https://doi.org/10.1155/2021/6674336

Nazir, M., Al-Ansari, A., Al-Khalifa, K., Alhareky, M., Gaffar, B., & Almas, K. (2020). Global prevalence of periodontal disease and lack of its surveillance. *The Scientific World Journal, 2020*, 1–8. https://doi.org/10.1155/2020/2146160

O'Leary, T. J., Drake, R. B., & Naylor, J. E. (1972). The plaque control record. *Journal of Periodontology, 43*(1), 38. https://doi.org/10.1902/jop.1972.43.1.38

Szczepaniak, P., Mikołajczyk, T. P., Cześnikiewicz-Guzik, M., & Guzik, T. J. (2021). Periodontitis as an inflammatory trigger in hypertension: From basic immunology to clinical implications. *Kardiologia Polska, 79*(11), 1206–1214. https://doi.org/10.33963/KP.a2021.0161

Zhan, Y., Jiao, J., Jing, W., Feng, X., Tai, B., Hu, D., Lin, H., Wang, B., Wang, C., Zheng, S., Liu, X., Rong, W., Wang, W., Wang, X., Si, Y., & Meng, H. (2023). Association between periodontitis and hypertension: Cross-sectional survey from the Fourth National Oral Health Survey of China (2015–2016). *BMJ Open, 13*(3), e068724. https://doi.org/10.1136/bmjopen-2022-068724