

# Prevalence of Periodontitis in Patients with Arterial Hypertension Followed in Dakar (Senegal)

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## Abstract

Periodontitis is an infectious, multifactorial disease associated with a dysbiotic microbiome. It manifests itself as inflammation of the superficial periodontium and progressive destruction of the deep periodontium. The prevalence of severe periodontitis is estimated at 7.4%, while that of milder forms could be as high as 50%. Arterial hypertension is a major public health problem, affecting more than 30% of adults worldwide. In Africa, particularly Senegal, there is a lack of epidemiological data linking these two diseases. The aim of this article was to determine the prevalence of periodontitis in a population of hypertensive monitored in Senegal. This was a descriptive cross-sectional study carried out on 112 patients with hypertension, followed a stratified random sampling with proportional allocation was carried out. For each participant, a periodontal clinical examination was performed. The data collected were entered into a Microsoft Excel 19 spreadsheet on Windows and analysed using STATA 17/IC/Mac software. The results showed a 50% prevalence of periodontitis in the study population, with 47.32% for severe forms and 2.68% for moderate forms. The 45 - 65 age group was the most representative. More than 2/3 of the study population were female, with a sex ratio of 0.47. 58.04% of patients had grade 2; 33.04% had grade 1, while only 8.92% had grade 3. Hypertension and periodontitis are two highly prevalent conditions worldwide, with a significant impact on the complications of cardiovascular disease. Our study highlighted the increased prevalence of periodontitis in patients with arterial hypertension.

## Keywords

Periodontitis, Arterial Hypertension, Prevalence

## 1. Introduction

Periodontitis is an infectious, multifactorial disease associated with a dysbiotic microbiome. It is characterized by the destruction of periodontal tissues, manifesting as inflammation of the superficial periodontium, clinical attachment loss, and progressive destruction of the alveolar bone, which can lead to tooth loss [1]. Its age-standardized global prevalence ranges between 7.4% and 11.2% [2] [3]. According to the Global Burden of Disease 2015, its milder forms are estimated at 50% [3].

Periodontal infections are associated with numerous systemic diseases. Over the past ten years, the relationship between the pathogenesis of many systemic diseases, including hypertension (HTN), and periodontal infection has been established based on various scientific evidence [4]. Hypertension is a persistent elevation of blood pressure above 140 mmHg systolic blood pressure (SBP) and/or 90 mmHg diastolic blood pressure (DBP) at rest [5]. It is a major public health issue affecting more than 30% of adults worldwide. In Africa, more than 40% of the adult population is affected, and this prevalence varies by country [6]. In Senegal, hypertension affects one in three Senegalese, or 3 million people, with an estimated prevalence of 29% among individuals aged 18 to 69 years [7]. Hypertension (HTN) and periodontitis are two widespread conditions globally with a significant impact on cardiovascular disease complications.

A bidirectional relationship has been suggested between these two pathologies in several studies [8]. According to Chui *et al.* 2018, patients with periodontitis have a higher prevalence of developing hypertension than periodontally healthy patients [9]. The biological mechanisms suggesting the link between periodontitis and the risk of elevated blood pressure have suggested the role of periodontal inflammation in vascular pathology [10]. The biological mechanisms underlying the potential link between periodontitis and hypertension remain unclear, mainly in terms of inflammatory and vasoactive endothelial responses [11]. However, the central role of immunity and inflammation in cardiovascular diseases, as well as the substantial evidence linking periodontitis with systemic diseases, may lead to consider this condition as a new cardiovascular risk factor. In addition, it has been shown that antibodies directed against periodontal bacteria, considered as a phenotype of the periodontal microbiota, have been associated with hypertension. In Africa, particularly in Senegal, there is a lack of epidemiological data linking these two pathologies. In Africa, particularly in Senegal, few studies linking these two pathologies have been conducted [12] [13]. To contribute to the production of epidemiological data, this study was conducted with the aim of determining the prevalence of periodontitis in a population of hypertensive patients followed in Senegal.

## 2. Methods

This was a descriptive cross-sectional study conducted among patients with hypertension who were followed in the cardiology departments of the University

Works Center of Dakar (COUD) and the Gaspard Camara Health Center.

The study participants were patients aged 18 years and older, suffering from hypertension diagnosed by a cardiologist, without any other cardiac pathology according to their medical records, and without any other general pathology except diabetes. They should have more than 20 teeth in their mouth and should not have received antibiotic treatment in the 2 months preceding inclusion or anti-inflammatory treatment in the 15 days preceding inclusion. All participants consented to participate in the study.

A stratified random sampling with proportional allocation was conducted. Indeed, 2 recruitment centers were chosen, each constituting a stratum. The proportion of each stratum was determined by proportional allocation. In 2022, based on available consultation records, 389 patients were followed for hypertension at the two sites, distributed as follows: 250 patients (64.28%) at COUD and 139 (35.72%) at Gaspard Camara. Within the strata, all individuals meeting the selection criteria were surveyed until the fixed sample size was reached at each site.

The sample size was calculated using STATA 17/IC Mac. Considering a 5% alpha risk with a power of 94%, referencing the study by Leye *et al.* 2011, it was 112 patients.

The collected variables were demographic variables (age, sex); lifestyle and habits (smoking, tooth brushing); variables related to periodontitis were collected according to the diagnostic criteria established by the new classification of periodontal diseases (clinical attachment loss, probing depth, alveolar bone loss, tooth mobility, bleeding index (BOP), plaque index (PI), age/bone loss percentage ratio); variables related to hypertension (systolic blood pressure (SBP), diastolic blood pressure (DBP), duration of hypertension, grade).

The data were collected using a periodontal clinical examination at the dental chair by the principal investigator. Data related to hypertension (HTN) were obtained from the patient's medical record. The collected data were entered into a Microsoft Excel 19 spreadsheet on Windows. After matching the data, the STATA 17/IC/Mac software was used for data analysis. Upstream, some variables were redefined or dichotomized. Each variable was also subjected to a usual descriptive analysis with frequencies for qualitative variables and means and standard deviations for quantitative variables, all of which were normally distributed.

### 3. Results

The study involved 112 patients, the average age was 56.36 years  $\pm$  13.01, and the most representative age group was 46 to 64 years (**Table 1**). More than two-thirds (67.86%) of the participants were women, with a sex ratio (m/f) of 0.47.

No hypertensive patients reported being a smoker, and only 6 of them (5.36%) were former smokers. According to them, none of the patients consumed alcohol. About 1/8th (12.50%) had diabetes (**Table 2**).

The average systolic blood pressure (SBP) was 163.08 mmHg  $\pm$  134 mmHg, and the average diastolic blood pressure (DBP) was 96.3 mmHg  $\pm$  8.27 mmHg. Ac-

cording to the hypertension (HTN) grade, 33.04% of patients had grade 1, while 58.04% had grade 2.

Periodontitis was present in 50% of the participants. The age group [46 - 65 years] was the most representative among patients with periodontitis (**Table 1**). About 13.39% of hypertensive patients had stage 4 periodontitis, and 33.93% had stage 3 periodontitis (**Table 3**). Mild forms were present in 2.68% of the participants. More than a third (36.6%) of severe forms were patients with grade 2 hypertension; 4.4% with grade 3, and 6% with grade 1 (**Table 4**).

**Table 1.** Distribution of the population by age group.

Groupe age	Work force	HTA	Parodontite
[25 - 45 years]	112	25 (28.74%)	7 (6.5%)
[46 - 65 years]	112	55 (66.27%)	37 (33%)
[Above 65 years]	112	32 (59.26%)	12 (10.7%)

**Table 2.** Distribution of the population according to risk factors.

Risque Factor	Status	HTA
Smoking	Yes	0
	No	112 (100)
Alcohol	Yes	0
	No	112 (100%)
Diabetes	Yes	14 (12.5%)
	No	42 (37.5%)

**Table 3.** Distribution of periodontitis in the study population.

Periodontitis (stage and grade)	HTA
Periodontitis+	56 (50%)
Periodontitis-	56 (50%)
Stage 2/Grade B	3 (2.68%)
Stage 3/Grade B	34 (30.36%)
Stage 3/Grade C	4 (3.57%)
Stage 4/Grade B	12 (10.71%)
Stage 4/Grade C	3 (2.68%)

**Table 4.** Distribution of periodontitis according to the grade of HTA.

Class HTA	Work force	Stage 2	Stage 3	Stage 4
	N	N (%)	N (%)	N (%)
1	37	1 (2.7%)	6 (16.21%)	1 (2.7%)
2	65	2 (3%)	28 (43%)	13 (20%)
3	10	0 (00%)	4 (40%)	1 (10%)

## 4. Discussion

The limitations of this study are related to the small sample size, which was reduced due to the non-acceptance of the periodontal assessment by some patients who felt they did not need it. However, the study showed a prevalence of 50% of periodontitis among patients with hypertension. This result is not far from that of

Khocht *et al.* (2017) in the United States, with a prevalence of 62%. Similarly, Chiu *et al.* (2020) showed a prevalence of 57% of severe periodontitis among 104 patients with essential hypertension. In Africa, Leye *et al.* (2011) in Senegal found a prevalence of 40%, and Eno Belinga *et al.* (2021) found a prevalence of 46% in Douala with a sample of 80 hypertensive patients [12]-[14]. Aguiéra, in their systematic review in 2023, confirmed an increased prevalence of periodontitis among patients suffering from hypertension [15]. This high prevalence of periodontitis among hypertensive patients could be explained by a possible association between the severity of periodontitis and that of hypertension described in the literature. Indeed, clinical and experimental data suggest that hypertension could cause microcirculatory changes in bone and gingival tissues, leading to ischemia, increased inflammation, and/or a modification of the microbial composition of the dental biofilm, which could be the cause of periodontitis [16]. The prevalence of severe forms of periodontitis (stage III and IV) in this study was 47.32%, with stage III periodontitis being more common among patients with grade 2 hypertension. These results are contrary to those of Yidrim *et al.* (2022), who showed a higher prevalence of stage 2 periodontitis among patients with hypertension [17]. The prevalence of hypertension in the presence of periodontitis among elderly subjects was recently evaluated in a systematic review including 30 prospective and retrospective studies published between 2003 and 2018. In 25 of the 30 studies included in the analysis, the prevalence of hypertension was high among elderly patients diagnosed with periodontitis compared to those with healthy periodontium [18]. According to Gordon *et al.* (2018), the prevalence of periodontitis increased with age, particularly between 30 and 40 years, reaching a threshold after 40 years with a prevalence of over 25% [19]. Our results showed that individuals aged 46 to 65 were the most affected, with 33%, which is consistent with the results reported by Zhao *et al.* (2019) in China [20], with an age range of 30 to 68 years. In Mali, Dzudie *et al.* (2017) found that the age group 25 - 44 years was the most represented, with 50.81% [21]. This difference could be explained by the fact that adults are the most affected by non-communicable diseases, including hypertension.

## 5. Conclusion

Hypertension and periodontitis are two widespread conditions globally, with a significant impact on cardiovascular disease complications. Our study highlighted the increased prevalence of periodontitis among patients with hypertension. This high prevalence thus justifies potential therapeutic and preventive strategies of public health interest, especially in our resource-limited countries.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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