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Research Article

Staging and Grading of Periodontitis in Relation to Hypertension: A Retrospective Study in Indonesia

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KEYWORDS

Blood pressure, Hypertension, Periodontitis

ABSTRACT

Introduction: Hypertension (HT), a leading cause of cardiovascular morbidity and mortality, affects a significant portion of the global population and is a major public health concern. Periodontitis is a multifactorial chronic inflammatory disease involving tooth-supporting structures. **Objective:** This study aims to evaluate the relationship between the severity of periodontitis and the prevalence of hypertension in an adult population. **Methods:** A retrospective cross-sectional study from medical records was conducted in this study. Data taken from medical records were age, gender, blood pressure, bleeding on probing, anti-hypertension drugs consumed by the patient, periodontitis diagnosis based on the 2017 classification, and history of other systemic diseases. This study involved 144 adult patients diagnosed with periodontitis, classified by staging (I-IV) and grading (A-C). **Results:** Hypertension's impact on periodontitis severity becomes more evident with advancing age. HT group exhibited a higher prevalence of severe periodontitis (Stages III and IV) compared to normotensive patients (p=0.000), particularly among older age groups (45-60 years (p=0.029) and >60 years (p=0.038). HT groups are more likely to exhibit Grade C periodontitis(p=0.04). HT patients demonstrate worse periodontal parameters that could contribute to accelerated disease progression and more severe outcomes. **Conclusion:** There is an association between the staging and grading of periodontitis and hypertension. These findings underscore the importance of a multidisciplinary approach in the management of periodontal and cardiovascular health to improve overall health outcomes.

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INTRODUCTION

The relationship between periodontitis and hypertension has garnered growing attention in recent years, as both conditions are highly prevalent and pose significant risk to systemic health. The inflammatory processes associated with periodontitis may contribute to the development and exacerbation of hypertension, creating a bidirectional relationship that complicates the management of both conditions.[1,2] Current evidence suggests periodontitis is a risk factor for cardiovascular disease, metabolic disorder, rheumatoid arthritis, and hypertension.[3-5]

Periodontitis is characterized by clinical attachment loss, alveolar bone resorption, bleeding on probing, and periodontal pockets. It can lead to tooth loss if not treated promptly. Pathogenesis of periodontitis is linked to microbial dysbiosis in subgingival biofilm and dysregulation of the host immune response. Microbial dysbiosis refers to an imbalance in the microbial community, leading to the predominance of pathogenic bacteria, which can lead to inflammation and tissue destruction.[6]

Dysbiosis has been associated with the development of metabolic disorder, cardiovascular disease, and hypertension.[7,8] Oral pathogens may influence gut microbiota composition, contributing to systemic dysbiosis, which in turn may promote arterial stiffness and elevated blood pressure.[9] The role of the oral microbiome in blood pressure regulation has garnered increasing attention in recent years, particularly in its association with periodontitis and systemic hypertension. The oral cavity hosts a diverse range of microbiomes that play a crucial role in various physiological processes, including the metabolism of dietary nitrates, which can influence blood pressure through the production of nitric oxide (NO), a potent vasodilator that helps regulate blood pressure.[10,11] Gordon et al. demonstrate that in older women, oral microbiome is integral to the reduction of nitrates to nitrite, which are then converted to NO. This suggests that maintaining a healthy oral microbiome could be beneficial for blood pressure management.[12]

Blood pressure is the term used to describe the strength with which your blood pushes on the sides of arteries as it is pumped around the body. Blood pressure categories are divided into four levels, such as normal (<120 systolic and < 80mmHg diastolic), elevated (120-129 systolic and < 80mmHg diastolic), stage 1 hypertension (130-139 systolic or 80-89 mmHg diastolic), and stage 2 hypertension (>140 systolic or >90mmHg diastolic).[13] High blood pressure, also known as hypertension, can lead to serious health problems, such as cardiovascular disease, stroke, and kidney damage.[14] The estimated number of all-cause deaths that were associated with diastolic blood pressure > 110-115 mmHg was 10.7 million deaths in 2015.[15]

The interplay between hypertension and periodontitis has garnered significant attention, particularly in the context of systemic health and cardiovascular disease. Hypertension, characterized by persistently elevated blood pressure, is a well-established risk factor for cardiovascular morbidity and mortality.[4] Concurrently, periodontitis, a chronic inflammatory disease affecting the supporting structures of the teeth, has been implicated in various systemic conditions, including cardiovascular diseases.[4,16]

While some studies suggest a potential link between these conditions, several investigations have found no direct association between hypertension and periodontitis. A population-based study in Finland did not provide evidence of an association between periodontal condition and arterial stiffness.[17] Kida et al. reported that other variables might confound the relationship between periodontal disease and hypertension.[18] A longitudinal study by Sakurai et al. found that improvements in periodontal health did not correlate with changes in blood pressure.[19] A hospital-based cross-sectional study by Al-Hasan et al. reported no connection between periodontitis and hypertension in the Egyptian population.[20]

This study aimed to evaluate the relationship between the severity and progressivity of periodontitis and hypertension.

MATERIALS AND METHODS

This research was a cross-sectional study with a retrospective approach using secondary data approved by the Dental Research Ethics Committee, Faculty of Dentistry Universitas Indonesia (27/Ethical Approval/FKGUI/V/2024). The data was gathered from medical records of periodontitis patients who visited the Periodontics Specialist Clinic at Universitas Indonesia Dental Hospital from January 2021 to January 2024. No prior sample size calculation was conducted as all eligible data available within the defined study period were included in the analysis. A total of 144 patients met the inclusion criteria and were included in the final analysis.

Data taken from medical records were age, gender, blood pressure, bleeding on probing, anti-hypertension drugs consumed by patient, periodontitis diagnosis, and history of other systemic disease. Medical records with incomplete data were not included in this study. The exclusion criteria in this study were patients underwent periodontal treatment, patients with a history of antibiotics and/or anti-inflammatory medication for the last 3 months, systemic factors such as diabetes mellitus, pregnancy, and smoking.. These factors were excluded to eliminate confounding factors that obscure the association between periodontitis and hypertension. Since this research was conducted in Universitas Indonesia Dental Hospital, a teaching hospital, periodontics residents carried out patients' examinations with the approval of a periodontist who had performed the calibration. The probe that was used in the patient's examination was UNC15.

Diagnosis criteria of periodontitis were interdental clinical attachment loss (CAL) is detectable at > 2 non-adjacent teeth, or buccal or oral CAL > 3 mm with pocketing > 3 mm is detectable at > 2 teeth, but the observed CAL cannot be described as non-periodontitis-related causes. The following are the criteria for determining staging and grading based on the latest classifications of periodontitis. Stage I was identified by 1-2mm CAL, < 15% radiographic bone loss (RBL), mostly horizontal bone loss, and max probing depth < 4mm. Stage II was identified by 3-4mm CAL, 15%-33% RBL, mostly horizontal bone loss, and max probing depth < 5mm. Stage III was identified by >5mm CAL, RBL extending to the middle third of root and beyond, vertical bone loss, and probing depth >6mm. Stage IV was identified by >5mm CAL, >5 teeth loss, with masticatory dysfunction and bite collapse. Since we exclude patients with diabetes and smokers, we only use primary criteria to determine the grading of periodontitis. Grade A was identified by no bone loss over 5 years or % bone loss/age <0.25, heavy biofilm deposits with low levels of destruction. Grade B identified by < 2mm bone loss over 5 years or % bone loss/age 0.25 to 1.0, destruction commensurate with biofilm deposits. Grade C was identified by > 2mm bone loss over 5 years or % bone loss/ age > 1.0, destruction exceeds expectations given biofilm deposits or early onset disease.

For the periodontal parameters, we extracted data from the medical records, including the Full-Mouth Bleeding Score (FMBS), Full-Mouth Plaque Score (FMPS), and the number of sites with a probing depth greater than 5 mm (nPPD >5 mm). The FMBS and FMPS were calculated based on the bleeding on probing (BoP) and plaque recorded at six specific sites per tooth during the comprehensive periodontal evaluation. The FMBS represented the percentage of bleeding sites out of all probed sites, while the FMPS indicated the percentage of plaque-covered sites relative to all examined sites.

Hypertension status was assessed using the data listed in the medical record. The blood pressure measurement procedure using sphygmomanometer in the patients' first visit to the hospital. Subjects are classified into the hypertension group if they consume anti-hypertensive drugs and/or blood pressure measurements of systolic blood pressure greater than or equal to 130 mmHg and/or diastolic blood pressure greater than or equal to 80 mmHg.

Statistical analyses were performed using SPSS (version 25; IBM Corp., Armonk, NY, USA). The primary outcome was periodontitis severity (classified by stages I–IV) and periodontitis progressivity (Grades A, B, and C), and secondary outcomes included periodontal parameters such as bleeding on probing (BoP), plaque scores, and number of sites with greater than 5 mm (PD > 5 mm) probing depths.

Comparisons of periodontal severity and parameters between hypertensive and normotensive patients were made using the Chi-square (X^2) test for categorical data, with subgroup analyses based on age and gender. Normally distributed continuous variables, such as plaque scores, were analyzed with independent t-tests. The Mann-Whitney U test was applied to compare nonparametric distributed variables, including BOP scores, between hypertensive and normotensive groups.

RESULTS

Medical records of 144 patients from January 2021 to January 2024 were reviewed. This study divided the distribution of patients by blood pressure status, gender, and age into two groups (Table 1): hypertensive (HT, n=70, 48.61%) and normotensive (NT, n=74, 51.39%). Most periodontitis patients were female in both group NT (33.33%) and HT (26.39%) group. The age group of 45 – 60 years old has the highest prevalence, both in the NT (23.61%) and HT (22.92%) group. This distribution data further indicates similar demographic patterns and age-related trends in both groups.

Table 1. Distribution of periodontitis patients

Periodontitis Patient (n=144)	NT n=74 (51.39%)	HT N=70 (48.61%)	p-value
Gender			0.235
Male	26 (18.05)	32 (22.22)	
Female	48 (33.33)	38 (26.39)	
Age			0.292
25-44	20 (13.89)	12 (8.33)	
45-60	34 (23.61)	33 (22.92)	
>60	20 (13.89)	25 (17.36)	

Table 2 presents the comparison of periodontitis severity (stage I - IV) according to gender and age between NT and HT groups. Severe periodontitis (stage III and IV) was more common in the HT group and notable variations were observed across gender and age groups. Among the male group, stage IV periodontitis was more prevalent in HT (27.6%) than in NT (6.9%). A similar trend was observed among females, with 19,8% of hypertensive patients in stage IV, compared to 8.1% in normotensive group.

Severe Periodontitis was significantly more prevalent among hypertensive patients in the 45-60 ($p<0.05$) and >60 years age group ($p<0.05$), compared to normotensive individuals. . In contrast, among individuals aged 25-44 years, presence of hypertension does not affect the severity of periodontitis ($p=0.159$). There is a greater proportion of the HT group in stage III (18.8%) and IV (22.9%) periodontitis, compared to periodontitis patients with normotension.

Table 2. Comparison of periodontitis staging based on 2017 classification between hypertensive (HT) group and normotensive (NT) group

	Stage	NT		HT		p-value
		N	Percentage	N	Percentage	
Male	Stage I	0	0	1	1.7	0.363
	Stage II	5	8.6	3	5.2	
	Stage III	17	29.3	12	20.7	
	Stage IV	4	6.9	16	27.6	
Female	Stage I	5	5.8	1	1.2	0.159
	Stage II	12	14	5	5.8	
	Stage III	24	27.9	15	17.4	
	Stage IV	7	8.1	17	19.8	
25-44 yo	Stage I	3	9.4	0	0	0.159
	Stage II	8	25	3	9.4	
	Stage III	8	25	9	28.1	
	Stage IV	1	3.1	0	0	
44-60 yo	Stage I	1	2.9	1	3	0.029*
	Stage II	5	14.7	3	9.1	
	Stage III	23	67.6	13	39.4	
	Stage IV	5	14.7	16	48.5	
>60 yo	Stage I	1	2.2	1	2.2	0.038*
	Stage II	4	8.9	2	4.4	
	Stage III	10	22.2	5	11.1	
	Stage IV	5	11.1	17	37.8	
Total	Stage I	5	3.5	2	1.4	0.000*
	Stage II	17	11.8	8	5.6	
	Stage III	41	28.5	27	18.8	
	Stage IV	11	7.6	33	22.9	

(*) Significantly difference ($p<0.05$) according to chi-square in the proportion of severe periodontitis (stages III and IV) and non-severe periodontitis (stages I and II) between hypertensive and normotensive patients

Table 3. Comparison of periodontitis grading between hypertensive (HT) group and normotensive (NT) group

	Stage	NT		HT		p-value
		N	Percentage	N	Percentage	
Male	Grade A	4	15.4	5	15.6	0.687
	Grade B	10	38.5	9	28.1	
	Grade C	12	46.2	18	56.3	
Female	Grade A	12	25	2	5.3	0.024*
	Grade B	23	47.9	18	47.4	
	Grade C	13	27.1	18	47.4	
25-44 yo	Grade A	9	45	2	16.7	0.199
	Grade B	6	30	7	58.3	
	Grade C	5	25	3	25	
	Grade A	5	14.7	4	12.1	0.029*
44-60 yo	Grade B	18	52.9	8	24.2	
	Grade C	11	32.4	21	63.6	
	Grade A	2	10	1	4	0.725
>60 yo	Grade B	9	45	12	48	
	Grade C	9	45	12	48	
Total	Grade A	16	21.6	7	10	0.04*
	Grade B	33	44.6	27	38.6	
	Grade C	25	33.8	36	51.4	

(*) Significance difference ($p<0.05$) according to chi-square

Table 4. Comparison of periodontal parameters, BOP, plaque score, and PD > 5mm between participants with hypertensive and normotensive

	HT				NT				p-value
	mean	SD	median	min-max	mean	SD	median	min-max	
FMBS	40.67	2.95	35.01	0-100	36.32	2.63	34	0.28-86	0.32
FMPS	47.32	2.83	50.55	0.19-100	37.35	2.49	38	0.31-97	0.09*
nPPD >5mm	19.41	2.62	11	0-83	12.54	2.01	5	0-77	0.05

(*) Significance difference ($p<0.05$) according to independent t-test
FMBS: Full-Mouth Bleeding Score, FMPS: Full-Mouth Plaque Score, nPPD >5mm: number of sites with probing depth >5mm

In terms of periodontitis grading, the HT group was more frequently classified as Grade C (51.4%), indicating rapid disease progression, compared to the NT group (33.8%). This difference was statistically significant among females, with only 5.3% of hypertensive female classified as Grade A (slow progression), compared to 25% in normotensive group, highlighting a potential vulnerability among hypertensive women to more aggressive forms of periodontitis. Additionally, hypertensive patients aged 44-60 years also showed a significantly higher prevalence of Grade C (63.6%) compared to the NT group (32.4%) (Table 3).

Table 4 shows the comparison of periodontal parameters (bleeding on probing (BOP), plaque score, and the prevalence of probing depths greater than 5mm (PD > 5mm) between HT and NT groups. The study found that the HT group tends to demonstrate worse periodontal parameters and could contribute to the acceleration of disease progression. Hypertensive patients exhibited mean plaque score (47.32) compared to normotensive patients (37.35). Although bleeding on probing (BOP) was higher among hypertensive patients, the difference was not statistically significant ($p= 0.32$). Hypertensive patients were more likely to develop advanced periodontal disease characterized by deeper pocket depths ($p=0.05$). In this study, nPPD >5mm refers to the number of sites with a probing depth greater than 5mm. Therefore, patients diagnosed with Stage I and II have an nPPD value is 0.

DISCUSSION

This study assessed the stage and grade of periodontitis with hypertension. The result of this study indicated that the impact of hypertension on periodontitis severity becomes more pronounced with increasing age. The hypertensive (HT) group exhibited a higher prevalence of severe periodontitis (Stages III and IV) compared to normotensive patients, particularly among older age groups (45-60 years and >60 years) and more likely to exhibit Grade C periodontitis. HT patients demonstrate worse periodontal parameters that could contribute to accelerated disease progression and more severe outcomes.

The association between hypertension and periodontitis has considerable importance because of the high prevalence of both the population and the serious impact on oral and general health. Greater severity of periodontitis was associated with higher systolic and diastolic blood pressure.[21] The present study provides compelling evidence of the association between hypertension and increased severity and progression of periodontitis. The findings align with previous research, which suggests that hypertension can exacerbate periodontal destruction due to shared inflammatory pathways between the two conditions, including elevated levels of pro-inflammatory cytokines such as interleukin-6 (IL-6) and C-reactive protein (CRP) that are common in both hypertension and periodontitis.[22]

HT patients in this study exhibited a higher prevalence of severe periodontitis (Stages III and IV), particularly among older age groups and females, reinforcing the need for integrated management strategies that address both conditions. Periodontal therapy significantly decreased levels of CRP and IL-6. This suggests that managing periodontal disease may have beneficial effects on hypertension by mitigating systemic inflammation.[23,24] A study by Zhan et al. shows a significantly greater proportion of participants with hypertension had stages I-IV periodontitis compared with participants with normotension and periodontal parameters were significantly worse in participants with hypertension than in participants with normotension.[25]

The observed gender-specific differences, where hypertensive females showed a higher prevalence of severe periodontitis compared to their normotensive counterparts, suggest a potential sex-specific vulnerability. Previous studies have also noted that females with hypertension are more likely to present with advanced periodontitis, possibly due to hormonal influences on the inflammatory response. This finding is important as it underscores the need for targeted prevention strategies in hypertensive women, who may be at a greater risk of severe periodontal outcomes.[26]

Specifically, the finding that only 5.3% of HT females were classified as Grade A (indicating slow progression) compared to 25% of non-hypertensive (NT) females underscores a potential vulnerability among hypertensive women to more aggressive forms of periodontitis. This aligns with previous studies that have documented a correlation between hypertension and increased severity of periodontal disease, particularly in female populations.[21,26]

Research indicated that hypertensive females may exhibit a higher prevalence of rapid progression compared to the normotensive females' group, suggesting a potential sex-specific vulnerability influenced by hormonal factors. The study conducted by Ahn et al. highlighted a significant association between hypertension and periodontitis in female adults. Their finding suggests that hormonal influences, including variations in estrogen and progesterone levels, may affect the inflammatory response. Thereby, increasing the susceptibility of hypertensive women to rapid progression of periodontitis.26 This aligns with the study by Gordon et al., who found that the prevalence of periodontal disease was notably higher in hypertensive women.[27]

Age-specific findings indicate that hypertension significantly increases the risk of severe periodontitis among older adults. Previous studies have highlighted that the risk of periodontitis increases with age and is compounded by systemic conditions such as hypertension.[26] Our studies finding that hypertensive patients aged 45-60 years and over 60 years exhibited significantly higher rates of severe periodontitis (Stages III and IV). The high prevalence of periodontitis observed in the 45–60 and over-60 age groups can be primarily attributed to the combined effects of aging-related immune dysfunction, endothelial dysfunction, and a persistent chronic inflammatory state referred to as inflammaging. As individuals age, the gradual decline in innate and adaptive immune responses reduces their capability to effectively control periodontal pathogens such as *Porphyromonas gingivalis*, thereby increasing susceptibility to infection and subsequent tissue destruction. These factors, along with shared risk factors like poor oral hygiene and aging, contribute to a more severe and faster progression of periodontitis in this group of ages. The increased prevalence of hypertension can be attributed to a confluence of age-related vascular, hormonal, and metabolic factors that evolve cumulatively over time. One of the primary contributors is the natural aging process of the cardiovascular system. Endothelial dysfunction and increased arterial stiffness leading to elevated systolic blood pressure. These changes, often described as part of the vascular aging process, compromise the elastic properties of blood vessels, thereby increasing peripheral resistance and contributing to isolated systolic hypertension, which is especially prevalent in older populations.

The relationship between hypertension and severe periodontitis among older adults indicates that hypertension may increase the risk of severe periodontitis in this demographic. Age-specific findings suggest that older adults particularly those with hypertension, may be more vulnerable to periodontal disease due to various factors, including systemic inflammation. A study by Hwang et al. found that poor oral hygiene and the extent of past oral inflammation, as reflected by tooth loss, were associated with hypertension incidence.[28]

Grading periodontitis further supports the impact of hypertension, with hypertensive patients more frequently classified as Grade C, reflecting a faster disease progression. This is consistent with previous research demonstrating that hypertensive patients are more prone to advanced periodontitis due to systemic inflammation and compromised immune responses. The significantly higher prevalence of Grade C periodontitis among hypertensive individuals, especially in the 44-60 age group, underscores the need for comprehensive periodontal care that includes blood pressure management. This result indicating that hypertensive (HT) individuals are more frequently classified as Grade C in periodontitis grading, particularly among females, suggests a significant association between hypertension and the severity of periodontal disease. The increased prevalence of Grade C periodontitis (63.6%) among hypertensive patients aged 44-60 years compared to the NT group (32.4%) further emphasizes the age-related vulnerability and the need for targeted periodontal care in this demographic. The association between age, hypertension, and periodontal disease severity has been supported by various studies, which suggest that older adults with hypertension are at a greater risk for severe periodontal conditions due to the cumulative effects of chronic inflammation and vascular dysfunction. Foratori-Junior et al. reported that morbidly obese patients with hypertension have a higher prevalence of periodontitis and greater severity of periodontal disease than those without hypertension.29 The severity and progression rate of periodontitis may be independent risk factors for hypertension. Increasing periodontitis progression rate was associated with a 35% increased risk for hypertension while increased periodontal disease severity was associated with a 20% increased risk for hypertension.[28]

The higher plaque scores and deeper periodontal pockets observed in hypertensive patients suggest a synergistic interaction between poor oral hygiene and systemic hypertension in worsening periodontal health. Specifically, the HT group exhibited a higher mean plaque score (47.32) compared to the NT group (37.35), indicating a greater accumulation of dental plaque, which is a primary etiological factor in periodontal disease progression. This result was aligned with a case-control study by Leye et al. in Senegalese patients, which found that oral hygiene was poor in patients with hypertension.[30] This lack of oral hygiene was probably due to poor brushing technique and the number of local factors that exaggerated periodontitis. Increased plaque accumulation can lead to more severe periodontal conditions. Although bleeding on probing (BOP) was not statistically significant between the groups, a trend toward higher BOP in hypertensive patients suggests a heightened inflammatory response. Other clinical parameters, such as probing pocket depth (PD > 5 mm), were significantly more prevalent in the HT group ($p=0.05$), reinforcing the link between hypertension and advanced periodontal destruction. This finding is consistent with previous studies.[27]

This finding suggests that although there is a tendency for increased gingival inflammation in the HT group, it may not be pronounced enough to reach statistical significance. The lack of statistical significance may also be attributed to sample size or variability within the groups, which warrants further investigation to confirm the relationship between hypertension and gingival inflammation.

In hypertensive patients, inflammation plays a significant role in pathophysiology. Elevated levels of inflammatory markers, such as C-reactive protein (CRP) and pro-inflammatory cytokines (IL-6 and TNF-a) are commonly observed in individuals with hypertension. These markers indicate systemic inflammation and are associated with an increased risk of cardiovascular disease. Inflammation contributes to hypertension by causing oxidative stress, which can lead to vascular damage and increased blood pressure.[31] Inflammatory mediators released during periodontal disease can contribute to endothelial dysfunction and vascular inflammation, which are critical in the development of hypertension.[32]

Hypertension and periodontitis may be related to a greater increase in oxidized lipoproteins at a systemic level. The relationship between circulating atherogenic particles (low-density lipoprotein, intermediate-density lipoprotein, and very low-density lipoprotein cholesterol) and hypertension is scientifically proven.[33] On the other hand, periodontitis is related to a greater increase in oxidized lipoproteins at a systemic level.[16]

The prevalence of probing depths greater than 5 mm (PD > 5 mm) was significantly higher in the HT group ($p=0.05$), indicating that hypertensive patients are more likely to develop advanced periodontal disease characterized by deeper periodontal pockets. This aligns with previous studies that have established a correlation between hypertension and increased severity of periodontal disease, suggesting that systemic hypertension may exacerbate periodontal tissue destruction.[30,34]

This study has several limitations. Firstly, the relatively small sample size may limit the generalizability of the findings to the broader population. Secondly, the study did not account for lifestyle and dietary factors, which could serve as important confounding variables. Lifestyle and dietary factors play a critical role in modulating both periodontal disease severity and hypertension, and emerging evidence suggests that these factors may interact synergistically to exacerbate the inflammatory processes underlying both conditions. Additionally, the severity of hypertension was not classified, which may have provided further insights into its association with periodontal disease. Lastly, the cross-sectional nature of the study restricts the ability to establish causality between hypertension and periodontitis. Further study needs to be done to explore the complex interaction between periodontitis and hypertension.

Overall, these findings underscore the complex interaction between hypertension and periodontitis. Hypertension appears to exacerbate both the severity and progression of periodontal disease, highlighting the need for integrated care approaches that address both conditions. Enhanced oral hygiene measures, regular periodontal monitoring, and targeted interventions should be considered essential components of care for hypertensive patients to mitigate the impact of systemic hypertension on periodontal health. Future research should explore the precise mechanisms linking hypertension and periodontal disease to develop more effective prevention and management strategies. However, this study has limitations, including its cross-sectional design, which restricts the ability to establish causal relationships between hypertension and periodontitis progression. Future longitudinal studies with larger sample sizes are recommended to confirm these associations and further explore the mechanisms linking hypertension and periodontitis.

CONCLUSION

There is a relationship between the severity and progression of periodontitis with hypertension, especially in older adults and women. Patients with hypertension tend to exhibit more advanced stages of periodontal disease, higher plaque score, and deeper probing depths, indicating worse periodontal health.

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CONFLICT OF INTEREST

The authors declare there are no conflict of interest in this study.

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