International Journal of Scientific Advances
ISSN: 2708-7972
Volume: 7 | Issue: 6 | Nov – Dec 2026 Available Online: www.ijscia.com
DOI: 10.51542/ijscia.v7i6.8

Oral Hygiene Status and Oral Complaints of Pre-Elderly Patients with Hypertension in Surabaya, Indonesia: A Descriptive Cross-Sectional Study

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ABSTRACT

Hypertension is a major chronic condition that is common among pre-elderly adults in Indonesia, yet descriptive data on the oral health of hypertensive patients at the primary care level remain limited. This descriptive cross-sectional study described the oral hygiene status and oral complaints of pre-elderly patients (45–54 years) with hypertension in the working area of Simomulyo Public Health Center, Surabaya. Ninety patients were recruited by accidental sampling in June 2024. Oral hygiene was examined with the Simplified Oral Hygiene Index (OHI-S), and oral complaints (medication-related lip swelling, dry mouth, metallic taste, pain during chewing, and gum bleeding) were collected by questionnaire. Data were summarized as frequencies and percentages. Most participants were women (73.3%). Only 11 participants (12.2%) had good oral hygiene, whereas 48 (53.3%) had moderate and 31 (34.4%) had poor oral hygiene. Pain during chewing was reported by 66.7% of participants (always or sometimes), gum bleeding by 47.8% (always or sometimes), dry mouth by 31.1%, metallic taste by 13.3%, and medication-related lip swelling by 3.3%. Suboptimal oral hygiene and frequent oral complaints were therefore common in this group, supporting the integration of oral health screening and promotion into hypertension care at primary health centers. Given the descriptive design and non-probability sampling, the findings describe the sample and should not be read as associations or generalized.

Keywords: oral health; hypertension; oral hygiene; oral complaints; OHI-S; pre-elderly; Prolanis; public health center; cross-sectional study

1 INTRODUCTION

Hypertension is one of the most common chronic medical conditions and is characterized by a persistent elevation of arterial pressure. It is defined as a systolic blood pressure of 130 mmHg or higher and/or a diastolic blood pressure above 80 mmHg [1]. The 2017 American College of Cardiology /American Heart Association guideline further classifies elevated pressure into stage 1 (systolic 130–139 mmHg or diastolic 80–89 mmHg) and stage 2 (systolic ≥140 mmHg or diastolic ≥90 mmHg) [2]. Worldwide, the prevalence of hypertension has risen by about 5.2% over the past decade [3], and in Indonesia it increased from 25.8% in 2013 to 34.1% in 2018 [4]. The 2018 National Basic Health Survey (Riskesdas) also showed that prevalence increases steeply with age, from 31.6% at 31–44 years to 45.3% at 45–54 years and 55.2% at 55–64 years [4]. Adults aged 45–54 years, often referred to as the pre-elderly, therefore represent a group in which hypertension is already highly prevalent and in which preventive care can still have a considerable effect.

Oral health has been linked with hypertension in several ways. Tooth loss and periodontal disease have been associated with a higher prevalence of hypertension, and periodontal conditions such as gingival bleeding, gingivitis, and periodontitis may contribute to systemic inflammation, immunological reactions, and endothelial dysfunction that can influence blood pressure [5,6]. One proposed mechanism is that inflammatory mediators produced in periodontitis enter the bloodstream and contribute to low-grade systemic inflammation, reflected in higher levels of C-reactive protein, interleukin-6, and fibrinogen, which is in turn related to cardiovascular risk [6].

The relationship also works through treatment: hyposalivation, gingivitis and periodontitis with gingival bleeding, lichenoid reactions, and gingival enlargement have been described in hypertensive patients, the last mainly in those taking calcium channel blockers such as nifedipine and amlodipine [7]. Oral health in hypertensive patients is therefore shaped both by local oral hygiene and by the systemic condition and its pharmacological management.

In the pre-elderly period, changes in the oral cavity, including tooth loss and disturbances of the periodontal tissues, may impair chewing, comfort when speaking, appearance, and the performance of daily activities, with consequences for physical, psychological, and social well-being [8]. Oral hygiene, restorative status, dental function, nutritional status, and use of dental services are recognized determinants of oral health in older age [9].

Simomulyo Public Health Center (*Puskesmas*) in Surabaya, Indonesia, recorded hypertension as the second most frequent disease in its 2023 visit statistics, with 4,215 visits and 144 hypertension-related visits between January and April 2024. These figures show that hypertension is a prominent health problem in the working area of this center. The center also runs the Chronic Disease Management Program (*Program Pengelolaan Penyakit Kronis*, Prolanis), a forum in which residents with systemic diseases, including hypertension, receive regular examinations and treatment from the center. Prolanis therefore provides an established platform through which patients with hypertension are reached repeatedly and could serve as a setting for oral health screening and promotion. However, information that specifically describes the oral health of pre-elderly hypertensive patients in this area is lacking, which limits the ability of local health planners to decide whether oral health services should be offered within hypertension care and within Prolanis. The aim of this study was therefore to describe the oral hygiene status and oral complaints of pre-elderly patients (45–54 years) with hypertension in the working area of Simomulyo Public Health Center. Specifically, we describe (i) oral hygiene status according to the Simplified Oral Hygiene Index (OHI-S) and (ii) self-reported oral complaints.

2 MATERIALS AND METHODS

2.1 Study design and setting

A descriptive, observational, cross-sectional study was conducted in the working area of Simomulyo Public Health Center, Surabaya, East Java, Indonesia. Data were collected from patients in June 2024 (5–11 June 2024). The study was carried out as part of a community dental public health field program of the Faculty of Dental Medicine, Universitas Airlangga. Because the purpose was to describe the oral health status of the target group, no hypothesis tests of association were planned.

2.2 Study population, sampling, and sample size

The target population comprised pre-elderly patients aged 45–54 years with hypertension living in the working area of Simomulyo Public Health Center. Participants were selected by accidental (convenience) sampling; that is, eligible patients who were encountered during the data collection period and agreed to take part were enrolled consecutively until the required sample size was reached. The inclusion criteria were: (i) a patient with hypertension aged 45–54 years and (ii) a native resident of the Simomulyo area. Patients who were uncooperative or unwilling to participate were excluded.

The minimum sample size was calculated using the Slovin formula, $n = N / (1 + N \cdot e^2)$, where N is the population size and e is the tolerated sampling error. With N = 857 and e = 0.1, the minimum sample size was 857 / 9.57 ≈ 89.6, which was rounded up to 90 participants. A total of 90 participants were enrolled, and all were included in the analysis, with no missing data.

2.3 Data collection and variables

Data were collected through a structured, interviewer-assisted questionnaire and an intraoral examination. The questionnaire, composed of closed-ended questions, was tested for validity and reliability before the main data collection. Sociodemographic variables were sex, highest level of education (elementary, junior high, senior high, diploma, or bachelor's degree), employment status (employed or not employed), monthly income relative to the regional minimum wage (*Upah Minimum Regional*, UMR; above, equal to, or below), and monthly expenditure relative to income (more than, equal to, or less than income).

Oral hygiene status. Oral hygiene was assessed with the OHI-S, which is the sum of the Debris Index (DI) and the Calculus Index (CI) described by Greene and Vermillion [10]. Six index teeth were examined: the buccal surfaces of teeth 16, 11, 26, and 31 and the lingual surfaces of teeth 36 and 46 [11]. Debris and calculus were scored according to the standard criteria, in which calculus is scored as 1 (no calculus), 2 (supragingival calculus covering less than one third of the tooth surface), 3 (supragingival calculus covering more than one third but not more than two thirds of the surface), or 4 (supragingival calculus covering more than two thirds of the surface). Each index was calculated as the total of the surface scores divided by the number of surfaces examined. Following the criteria applied in this study, scores of 0–0.6 were classified as good, 0.7–1.8 as moderate, and 1.9–3.0 as poor [11].

Oral complaints. Oral complaints were self-reported through questions on five items: lip swelling attributed to medication (yes, no, or do not know), dry mouth (yes, normal, or do not know), metallic taste in the mouth (yes, normal, or do not know), pain during chewing (always painful, sometimes painful, or not painful), and gum bleeding (always, sometimes, or normal). These items were selected because they correspond to oral manifestations and adverse effects reported in hypertensive patients [7].

2.4 Ethical considerations

The study protocol was declared ethically appropriate in accordance with the seven standards of the World Health Organization (2011) by the Health Research Ethical Clearance Commission, Faculty of Dental Medicine, Universitas Airlangga, Surabaya (ethical clearance certificate number 0669/HRECC.FODM/VII/2024, issued on 4 July 2024). The purpose and procedures of the study were explained to all potential participants, and informed consent was obtained before the questionnaire and the oral examination. Participation was voluntary, and the data were handled confidentially and reported only in aggregate form.

2.5 Data analysis

Data were entered and analyzed with IBM SPSS Statistics. Categorical variables were summarized as frequencies and percentages. Oral hygiene categories were described for the total sample and by sex, and the distribution of each oral complaint was described for the total sample. No inferential statistics were applied, and results are presented descriptively.

3 RESULTS

3.1 Characteristics of the participants

A total of 90 pre-elderly patients with hypertension participated. As shown in Table 1, women made up almost three-quarters of the sample (66 participants, 73.3%) and men one-quarter (24 participants, 26.7%). Senior high school was the most common level of education (46.7%), followed by junior high school (25.6%) and elementary school (13.3%); only 14.4% had a diploma or a bachelor's degree. More than half of the participants were employed (58.9%). Almost half reported an income below the regional minimum wage (47.8%), and 42.2% reported an income equal to it, whereas only 10.0% reported an income above it. Monthly expenditure was equal to income for 58.9% of participants and higher than income for 22.2%.

TABLE 1: Sociodemographic characteristics of pre-elderly patients with hypertension (n = 90).

Characteristic	n	%
Sex		
Male	24	26.7
Female	66	73.3
Highest education		
Elementary school	12	13.3
Junior high school	23	25.6
Senior high school	42	46.7
Diploma (D1/D2/D3)	4	4.4
Bachelor's degree	9	10.0
Employment status		
Employed	53	58.9
Not employed	37	41.1
Monthly income relative to UMR		
Above UMR	9	10.0
Equal to UMR	38	42.2
Below UMR	43	47.8
Monthly expenditure relative to income		
More than income	20	22.2
Equal to income	53	58.9
Less than income	17	18.9

UMR, regional minimum wage (Upah Minimum Regional).

3.2 Oral hygiene status

The distribution of OHI-S categories is presented in Table 2. Only 11 of the 90 participants (12.2%) had good oral hygiene. The largest group had moderate oral hygiene (48 participants, 53.3%), and 31 participants (34.4%) had poor oral hygiene. In other words, 87.8% of the participants had oral hygiene that was less than good. None of the 24 men had good oral hygiene, compared with 11 of 66 women (16.7%). Poor oral hygiene was recorded in 41.7% of men and 31.8% of women.

TABLE 2: Distribution of oral hygiene status (OHI-S) by sex, n (%).

Sex	Good	Moderate	Poor	Total
Male	0 (0.0)	14 (58.3)	10 (41.7)	24 (100)
Female	11 (16.7)	34 (51.5)	21 (31.8)	66 (100)
Total	**11 (12.2)**	**48 (53.3)**	**31 (34.4)**	**90 (100)**

OHI-S, Simplified Oral Hygiene Index. Percentages are row percentages.

3.3 Oral complaints

The distribution of the reported oral complaints is shown in Table 3. Pain during chewing was the complaint reported most often: 18 participants (20.0%) reported that chewing was always painful and 42 (46.7%) that it was sometimes painful, so that two-thirds (66.7%) experienced chewing pain at least occasionally. Gum bleeding was reported as always present by 7 participants (7.8%) and as sometimes present by 36 (40.0%), a total of 47.8%. Dry mouth was reported by 28 participants (31.1%), and a metallic taste by 12 (13.3%). Lip swelling attributed to medication was reported by only 3 participants (3.3%), but 42 participants (46.7%) answered that they did not know. A further 15 participants (16.7%) did not know whether they had dry mouth and 23 (25.6%) did not know whether they had a metallic taste in the mouth.

TABLE 3: Distribution of self-reported oral complaints (n = 90).

Complaint	Response	n	%
Lip swelling attributed to medication	Yes	3	3.3
	No	45	50.0
	Do not know	42	46.7
Dry mouth	Yes	28	31.1
	Normal	47	52.2
	Do not know	15	16.7
Metallic taste	Yes	12	13.3
	Normal	55	61.1
	Do not know	23	25.6
Pain during chewing	Always painful	18	20.0
	Sometimes painful	42	46.7
	Not painful	30	33.3
Gum bleeding	Always bleeding	7	7.8
	Sometimes bleeding	36	40.0
	Normal	47	52.2

4 DISCUSSION

4.1 Principal findings

This descriptive study of 90 pre-elderly patients with hypertension at a primary health center in Surabaya produced two main observations. First, adequate oral hygiene was uncommon: fewer than one in eight participants had good OHI-S status, and more than a third had poor status. Second, oral complaints were frequent, especially pain during chewing and gum bleeding. Together, these findings suggest that many patients may have unmet oral health needs.

4.2 Oral hygiene status and its relevance to hypertension care

The OHI-S is based on the amount of debris and calculus on index teeth. Accumulated debris supports plaque formation, and plaque that persists and mineralizes forms calculus, which retains further plaque and makes effective cleaning difficult, thereby raising the risk of gingival inflammation if it continues [10,11]. That 87.8% of our participants had moderate or poor oral hygiene is therefore of concern from the perspective of periodontal health.

Periodontal inflammation has been proposed to contribute to low-grade systemic inflammation and endothelial dysfunction related to blood pressure regulation [5,6]. Maintaining periodontal health is therefore a reasonable component of overall care for hypertensive patients. It should be emphasized, however, that these findings do not mean that hypertension itself causes poor oral hygiene, and the cross-sectional, descriptive design of this study does not allow conclusions about the direction or existence of an association between oral hygiene and blood pressure. Without a comparison group of normotensive adults, we also cannot say whether the oral hygiene of our participants differs from that of the general population of the same age.

Women accounted for 73.3% of the participants. Hormonal changes related to menopause have been suggested to contribute to higher blood pressure in women as estrogen levels decline [12], which may partly explain the presence of many women in a hypertensive pre-elderly group. Nevertheless, because accidental sampling was used, the sex distribution is also determined by who was present at the center and willing to participate, and our data cannot be used to compare the prevalence of hypertension between women and men. The finding that none of the 24 men had good oral hygiene, compared with 16.7% of women, should likewise be treated as a descriptive observation based on small numbers.

4.3 Oral complaints

Pain during chewing was reported by two-thirds of the participants, at least occasionally. Chewing pain reduces the ability to bite and masticate, and poor dental status leads to chewing difficulty, restricted diet, and poorer food choices, which may increase the risk of chronic disease [9]. For patients with hypertension, who are usually advised to modify their diet, difficulty with chewing may be an additional barrier to a healthy eating pattern. The role of dental pain, tooth loss, or ill-fitting prostheses was not examined in this study and deserves attention in future work.

Almost half of the participants (47.8%) reported that their gums bled always or sometimes. Gingival bleeding is a sign of gingival inflammation, and gingivitis and periodontitis have been described as the most frequent oral manifestations, together with gingival bleeding, in hypertensive patients [7]. This finding is consistent with the large proportion of participants with moderate or poor OHI-S status. Dry mouth was reported by 31.1% of participants. Hyposalivation has been described as a clinical manifestation in hypertensive patients [7], and complaints arising from xerostomia can affect oral health and, in turn, quality of life in older people [13]. Because medication data were not collected, we cannot determine whether dry mouth or the metallic taste reported by 13.3% of participants was related to antihypertensive drugs or to other causes. Only 3 participants (3.3%) attributed lip swelling to their medication, but nearly half (46.7%) answered that they did not know. Similarly, a quarter of participants did not know whether they had a metallic taste in the mouth. A high proportion of "do not know" responses can reflect limited awareness of possible oral adverse effects of medication or limited self-observation of oral symptoms. This points to an opportunity for patient education at the primary care level: patients taking antihypertensive drugs can be informed about which oral changes to look for and encouraged to report them.

4.4 Implications for public health practice

The results suggest that hypertension care at a public health center could be an appropriate entry point for oral health promotion. At Simomulyo Public Health Center, the Prolanis program is a natural vehicle for this purpose. Because Prolanis already brings residents with systemic diseases, including hypertension, to the center for regular examination and treatment, oral health measures can be added to its routine activities without creating a separate program or asking patients to make an additional visit. Practical options include routine oral health questions or simple screening for gum bleeding, dry mouth, and chewing pain during Prolanis check-ups and hypertension consultations, oral health education during Prolanis meetings, toothbrushing and oral hygiene education for patients, and a clear referral pathway from Prolanis to the dental unit. Health promotion programs should also address the potential oral effects of antihypertensive drugs, so that patients know when to seek care. These suggestions follow from the descriptive burden of oral hygiene problems and complaints in this sample and should be tested in program evaluation before they are adopted more widely.

4.5 Strengths and limitations

The strengths of this study include the use of a standardized clinical index (OHI-S) alongside patient-reported measures, a sample size calculated a priori, and complete data for all 90 participants. Several limitations should be noted. The use of accidental sampling at one public health center means that the sample may not represent all pre-elderly hypertensive patients in Surabaya, and the predominance of women limits conclusions for men. Whether participants were enrolled in Prolanis was not recorded, so we cannot say how far these findings apply to Prolanis members as opposed to other hypertensive patients at the center. The criteria used to confirm hypertension, blood pressure level, duration of disease, type of antihypertensive medication, smoking status, and comorbidities such as diabetes were not analyzed, although all may influence oral health. Oral complaints were self-reported, and the high proportion of "do not know" answers shows that some symptoms may have been missed or misreported. Periodontal status was assessed by self-reported gum bleeding and by OHI-S, which measures debris and calculus rather than periodontal attachment loss, and no examination of caries, tooth loss, or denture status was included. The study had no control group, so comparisons with normotensive people could not be made.

Future research with probability sampling, a normotensive comparison group, clinical periodontal and dental examinations, and analytic methods suited to testing associations are recommended.

5 CONCLUSION

Among 90 pre-elderly patients with hypertension in the working area of Simomulyo Public Health Center, only 12.2% had good oral hygiene, and pain during chewing, gum bleeding, and dry mouth were commonly reported. These descriptive findings indicate a need for oral health screening, education, and referral to be integrated into hypertension care at primary health centers. Studies with analytic designs are needed to examine the relationship between oral health and hypertension and its management in this population.

DECLARATIONS

Ethical approval: The study protocol was declared ethically appropriate in accordance with the seven standards of the World Health Organization (2011) by the Health Research Ethical Clearance Commission, Faculty of Dental Medicine, Universitas Airlangga, Surabaya (ethical clearance certificate number 0669/HRECC.FODM/VII/2024, issued on 4 July 2024). *Conflict of interest:* The authors declare no conflict of interest. One co-author (R.S.) is the Head of Simomulyo Public Health Center, the study site. *Funding:* This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors. *Acknowledgments:* The authors thank the staff of Simomulyo Public Health Center and all participants.

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