



Prevalence of Tongue Normal Variant Lesions in Geriatric Patients with Hypertension in Surabaya: A Multicenter Observational Study

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Abstract

Introduction The risk of degenerative diseases in the elderly is higher due to aging and decreased body function. This process affects both systemic conditions and locally in the oral cavity. Aside from aging, degenerative disease itself can trigger the incidence of soft tissue abnormalities. Aging can cause structural and functional changes in the systemic vasculature, resulting in a degenerative disease such as hypertension. Elderly who suffers from hypertension can develop oral mucosa abnormalities and most of them are found on the tongue. This study was aimed to identify the prevalence of normal variant lesions on the tongue in the elderly with hypertension.

Methods This was an observational descriptive study with a cross-sectional design done in January–March 2020. Samples were elderly obtained from several public health centers in Surabaya that matched the inclusion criteria. Subjective and clinical examinations were performed by oral medicine residents and specialists.

Results A total of 401 elderly were screened and 147 elderly (36.65%) met the inclusion criteria which are having hypertension and willing to participate in this study. Those who met the criteria, mainly were female from the 60 to 74 years old age group. Normal variants of tongue obtained from the examination were fissured tongue (90.48%), coated tongue (63.95%), crenated tongue (33.33%), lingual varices (12.24%), and benign migratory glossitis (4.08%).

Conclusion From this study, we figured out that fissured tongue was the most common normal variant lesion of the tongue in the elderly with hypertension. Coexistence between hypertension and tongue lesions can be developed from pathological changes of disease or as side effects of medication taken such as antihypertensive drugs.

Keywords

- ▶ tongue
- ▶ normal variants
- ▶ geriatric
- ▶ hypertension
- ▶ oral medicine

Introduction

Hypertension is characterized by persistently high blood pressure (BP) in the systemic arteries and several etiologies can underlie hypertension. The majority (90–95%) of patients have a highly heterogeneous “essential” or primary hypertension with a multifactorial gene–environment etiology. Positive family history is a frequent occurrence in patients with hypertension, with the heritability estimated between 35 and 50% in the majority of studies.¹ Hypertension is the primary risk factor for global disease burden and causes organ damage already in the presymptomatic phase, before causing cardiovascular diseases such as stroke and myocardial infarction. It is therefore important to discover and treat hypertension as early as possible.²

Oral health is important to the quality of life of individuals of all age groups. Oral lesions can lead to interference with daily activities due to discomfort or pain that interferes with mastication, swallowing, and speech.³ In medical philosophies, the tongue has been believed to be an indicator of health for several decades. Customarily, the tongue is known to be a mirror of oral and general health. Hippocrates, Galen, and others considered the tongue as the barometer of health.⁴ In oral mucosal disorders, tongue lesions constitute substantial proportions. A variable range of prevalence rates has been reported in different regions. This difference may get along with racial factors, gender, and systemic disorders, and so forth.⁵

Oral lesions affect between 2.47 and 98% of the elderly.⁶ The location of the most abnormalities is on the tongue. Lesions on the tongue are associated with the elderly with hematological diseases, diabetes mellitus, dermatology, and some gastrointestinal ailments.⁷ An association between sublingual varices and smoking, age, and hypertension was found. The prevalence of sublingual varices increased with the stage of hypertension, further confirming the connection to increased BP. The correlation between sublingual varices and hypertension has not been previously shown.²

Routine examination of the oral cavity in the elderly is highly recommended to reduce the rate of tongue lesions in the elderly with hypertension. Until now, there have not been many studies that can provide an overview of the tongue lesion in the oral cavity associated with hypertension in the elderly. This research is expected to be useful as optimal treatment standards for dentists as well as input for health workers in the management of geriatric patients with hypertension related to the impact of tongue lesions.

Methods

This study is an observational descriptive study with a cross-sectional study design conducted in several public health centers in Surabaya. Ethical clearance was issued from the Research Ethical Clearance Commission of Faculty of Dental Medicine, Universitas Airlangga with registration number 363/HRECC.FODM/VI/2019. This multicenter observational study was conducted from January to March 2020 and involved nine public health centers in Surabaya, which

were Jeruk, Made, Mojo, Balas Klumprik, Pucang, Ketabang, Mulyorejo, Keputih, and Sidotopo. These public health centers were collaborated with Faculty of Dental Medicine, Universitas Airlangga for several oral health programs including education, research, and community development.

The population of this study consists of the elderly from the geriatric community under the public health centers mentioned earlier. They were gathered and asked to participate in this study. All the elderly who agreed to participate signed informed consent and were screened by the oral medicine specialists and residents from Department of Oral Medicine, Faculty of Dental Medicine, Universitas Airlangga. The screening was aimed at identifying whether participants met the inclusion criteria or not. Elderly aged 60 years or more with hypertension (identified by anamnesis) who consented to participate in this study are included. While the elderly younger than 60 years, with no hypertension, having difficulty with mouth opening, and did not give consent to participate are excluded from this study.

Data collection procedures for this study are anamnesis and oral clinical examination. Anamnesis was done to get the identity, demographic status, and hypertension status of the elderly participants. Then oral clinical examination was done to identify any oral lesion found in the oral cavity. Data obtained will be presented descriptively in the form of a percentage and by using a prevalence rate.

Results

From those periods of study and involving all public health centers, a total of 401 elderly were screened as study population, then 147 elderly (36.65%) met the inclusion criteria who are aged 60 years or older, having hypertension, and gave consent to participate in this study. Demographic aspects show that most of them were female from the 60 to 74 years old age group (► **Table 1**). Further examination was done to identify the subject’s hypertension status, including medication used to treat hypertension. Most of them consumed amlodipine ($n = 125$; 85.03%) as an antihypertension drug, whether in a single medication or combined with other medication (► **Table 2**).

The most common normal variant of the tongue obtained from the examination was fissured tongue ($n = 133$; 90.48%).

Table 1 Demographic data from elderly who met inclusion criteria of the study

Demographic aspect	Number of subjects	Percentage
Sex		
Male	30	20.41%
Female	117	79.59%
Age		
60–74 y	123	83.67%
75–90 y	24	16.33%
> 90 y	0	0%
Total subjects	147	

Table 2 Antihypertensive drugs that are taken by participants of this study

Drugs	Number of subjects	Percentage
Amlodipine	125	85.03%
Captopril	5	10.20%
Nifedipine	4	2.72%
Others	3	2.04%
Total subjects	147	

Table 3 Prevalence of tongue normal variants in elderly with hypertension

Oral normal variance	Number of subjects	Percentage
Fissured tongue	133	90.48%
Coated tongue	94	63.95%
Crenated tongue	49	33.33%
Lingual varices	18	12.24%
Geographic tongue	6	4.08%
Total subjects	147	

The second-most common was coated tongue which was found in more than half of the samples ($n = 94$; 63.95%). Other normal variants of the tongue identify from this study were crenated tongue, lingual varices, and geographic tongue (► **Table 3**).

Discussion

Aging is an inevitable part of life and comes with two processes including physiologic decline and disease state.⁸ According to current studies, three out of four elderly older than 65 years suffer from three or more chronic conditions such as cardiovascular disease, diabetes mellitus, obesity, stroke, cognitive impairment, and hypertension. Although it is not considered a normal aging process, there is a clear association between increased BP and the incidence of hypertension.⁹ Along with other systemic conditions, the prevalence of hypertension tends to increase with age. Framingham Heart Study showed that 90% of people at age 55 years with normal BP will eventually develop hypertension.¹⁰

In India, a meta-analysis study showed that the overall prevalence of hypertension is 29.8%, and several studies show an increasing prevalence rate.¹¹ In this study, among 401 elderly who participated, a total of 147 elderly (36.65%) had hypertension, higher but in a similar range from the meta-analysis study mentioned before in India. These variations can be associated with various aspects, mainly socioeconomic status. But a study shows that one-third of the elderly was aware of their condition, and out of these, two-thirds were on treatment.¹² Therefore, in this study, most of the elderly with hypertension were taking medication to their awareness of their condition.

Some underlying mechanisms of hypertension in the elderly have been proposed, such as mechanical hemodynamic changes, arterial stiffness, neurohormonal and autonomic dysregulation, and kidney aging.¹⁰ Aging can also cause impaired oral function in the elderly, both caused by underlying illness and medication associated with a certain disease. Oral impairment in the aging process is marked by extensive structural and physiological changes including oral mucosa, tongue, and salivary glands.¹³ The oral mucosa becomes less elastic and pale, decreased production of saliva, also tongue depapillation.¹⁴ Current studies state that there is no recognized oral manifestation of hypertension but medication using antihypertensive drugs can often develop side effects in the oral cavity.¹⁵ This study focuses on normal variant lesions on the tongue because the previous study showed that the tongue is a good indicator of the oral cavity as a mirror of general health and easy accessibility in daily examination.¹⁶

The result of this study showed that fissured tongue is the most common normal variant lesions on the tongue found in the elderly with hypertension ($n = 133$; 90.48%). A study from India reported the same result, fissured tongue was the most common lesion along with hypertension rather than other degenerative diseases.⁴ Contradicting with our result a study conducted in Afghanistan showed that fissured tongue coexistent with diabetes mellitus followed by hypertension.¹⁷ In comparison, in the Dental Hospital Airlangga University, the prevalence of fissured tongue in healthy elderly (without degenerative diseases, including hypertension) also showed similar result with a percentage of 93.1%.¹⁸ Based on the result of this study, elderly who take amlodipine were as many as 125 (8.57%) and in proportion with the numbers of participant who suffered fissured tongue.

Fissured tongue is characterized by multiple fissures and grooves on the dorsal surface of the tongue. They are considered as oral normal variant lesions found in 20 to 30% of the population. The etiology of fissured tongue is idiopathic but often developed from the aging process and hyposalivation in the oral cavity.^{19,20} Association between fissured tongue and systemic condition has not been discovered extensively in any literature. Fissured tongues may appear to be coexistent with hypertension or other systemic diseases, but statistically, they are not significantly correlated.¹⁶ The hyposalivation effect of antihypertensive medications such as amlodipine may contribute to the development of fissured tongue which suggests a correlation between the use of this drug and the development of fissured tongue. Nevertheless, there are still limited data regarding the effect of amlodipine on fissured tongue.²¹ Fissured tongue is usually asymptomatic and does not require treatment. Food debris can get stuck in deep fissures and may cause mild discomfort due to inflammation and secondary fungal infections. To prevent symptoms from recurring, patients are advised to gently brush their tongues daily. Antifungal drugs may be prescribed if necessary.¹⁴

Coated tongue is the second most common normal variant lesion on the tongue from this study, which occupied more than half of subjects. A total of 94 elderly (63.95%) in this study had coated tongues, similar to another study in

Surabaya involving the geriatric population with a prevalence of coated tongue is 55.6%.²⁰ Although another study showed that coated tongue prevalence was lower, that study concluded that coated tongue was the most common lesion, while this study showed that coated tongue was second-most common. Coated tongue is often confused with other white lesions on the dorsal surface of the tongue if a further examination was not done. The clinical appearance of coated tongue is similar to acute pseudomembranous candidiasis; however, coated tongue does not leave any pain or redness after scraping off the white lesion.²² Removing tongue coating using a toothbrush or a tongue scraper can improve tongue hygiene and reduce coated tongue.²³

In this study, it was found that 33.33% of the elderly with hypertension had a crenated tongue. Other studies found a lower prevalence of crenated in healthy elderly with a prevalence of 27.59%.¹⁸ Crenated tongue may develop due to various factors involving tongue pressure, including habits such as pressing the tongue against the teeth, pushing or sucking on the tongue, bruxism, macroglossia, and tongue thrusting.²⁴ Management of crenated tongue focuses on treating the underlying cause and promoting oral health. However, it is not related to local factors, and additional investigation is required.²⁵

This study showed that 12.24% of the elderly had lingual varices, while other studies found a higher prevalence of lingual varices in healthy elderly with a prevalence of 15.52%.¹⁸ Lingual varices are developmental anomalies in old age that cause abnormal dilation of veins with unknown causes and may occur on the ventral surface of the tongue. Once the diagnosis is confirmed by the clinical examination, no treatment is required.²⁵

This study showed that 4.08% of the elderly had geographic tongue. While other studies found a higher prevalence of geographic tongue in healthy elderly with a prevalence of 6%.²⁶ Geographic tongue is typically asymptomatic and often discovered incidentally during routine oral examinations. The exact cause of geographic tongue is unknown, but both hereditary and environmental factors may contribute. Clinically, geographic tongue is characterized by distinct red areas with well-defined borders caused by the atrophy of filiform papillae. Treatment for geographic tongue is mainly focused on managing symptoms, such as a burning sensation or sensitivity to hot or spicy foods. Mouthwashes containing steroids or anesthetic agents may be used to alleviate these symptoms in affected patients.²⁵

Some of the lesions of the tongue with high prevalence, namely, fissured and coated tongue found in this study appear in elderly with hypertension who take antihypertensive drugs. As explained before, there is no significant correlation between hypertension and oral lesions, the coexistence of both conditions is possibly because of medication used in hypertension that causes hyposalivation.^{15,19,20} In this study, 125 elderly (85.03%) use amlodipine as their medication. amlodipine is a first-choice antihypertensive drug from the group of calcium channel blockers that has a mechanism of action by inhibiting the influx of calcium ions into heart muscle cells and vascular smooth muscle so that the relaxing

effect results in decreasing BP.²⁷ In salivary glands, calcium channel blockers suppress water secretion which is 99% component of saliva and then causes dry mouth.²² Another mechanism of calcium channel blockers is inhibiting the action of parasympathetic nerves, and presynapses calcium pathway is blocked so that calcium ions cannot enter post-synapses. As a result of blocked calcium pathway, the production of acetylcholine decreases and production of saliva is inhibited.²⁸ Hyposalivation can lead to oral mucosal changes in the form of oral lesions like fissured tongue due to dryness and decreased self-cleansing function of saliva which makes food debris trapped over the dorsal surface of the tongue resulting in coated tongue formation.

Conclusion

In conclusion, elderly with hypertension commonly developed fissured tongue followed by coated tongue as normal variant lesions on their tongue. The etiology of these lesions in hypertensive patients remains unclear, but some studies suggest an indirect association related to antihypertensive drugs and hyposalivation. A meta-analysis study stated that it cannot be assured that patients taking antihypertensive have more hyposalivation than those who are not. It is because of the variability of saliva collection and heterogeneity of type of antihypertensive taken.²⁹ Despite all the limitations of this study, the clinical appearance of normal variant lesions on the tongue can be used by the clinician to improve oral health, especially in elderly with hypertension, and increased quality of life in geriatric patients. Future studies could be performed with adequate sample calculation and improved methods to provide strong evidence about this topic.

Conflict of Interest

None declared.

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References

- Oparil S, Acelajado MC, Bakris GL, et al. Hypertension. *Nat Rev Dis Primers* 2018;4:18014
- Accardo A, Pascazio L, Costantinides F, Gorza F, Silveri G. Influence of hypertension and other risk factors on the onset of sublingual varices. *BMC Oral Health* 2021;21(01):235
- Bilgic A, Aydin F, Sumer P, et al. Oral health related quality of life and disease severity in autoimmune bullous diseases. *Niger J Clin Pract* 2020;23(02):159-164
- Sudarshan R, Sree Vijayabala G, Samata Y, Ravikiran A. Newer classification system for fissured tongue: An epidemiological approach. *J Trop Med* 2015;2015:262079
- Oivio UM, Pesonen P, Ylipalosaari M, Kullaa A, Salo T. Prevalence of oral mucosal normal variations and lesions in a middle-aged population: a Northern Finland Birth Cohort 1966 study. *BMC Oral Health* 2020;20(01):357

- 6 Cheruvathoor DD, Thomas V, Kumar NR, Jose M. High prevalence of oral mucosal lesions in elderly: call for revolutionizing geriatric dental care strategies. *J Family Med Prim Care* 2020;9(08):4375–4380
- 7 Bozdemir E, Yilmaz HH, Orhan H. Oral mucosal lesions and risk factors in elderly dental patients. *J Dent Res Dent Clin Dent Prospect* 2019;13(01):24–30
- 8 Fabbri E, Zoli M, Ferrucci L. Age-related physiologic declines. In: Michel JP, ed. *Oxford Textbook of Geriatric Medicine*. 3rd ed. Oxford University Press; 2017:303–310
- 9 Kithas PA, Supiano MA. Hypertension in the geriatric population: a patient-centered approach. *Med Clin North Am* 2015;99(02):379–389
- 10 Oliveros E, Patel H, Kyung S, et al. Hypertension in older adults: assessment, management, and challenges. *Clin Cardiol* 2020;43(02):99–107
- 11 Anchala R, Kannuri NK, Pant H, et al. Hypertension in India: a systematic review and meta-analysis of prevalence, awareness, and control of hypertension. *J Hypertens* 2014;32(06):1170–1177
- 12 Chauhan S, Gupta SS, Kumar S, Patel R. Urban-rural differential in diabetes and hypertension among elderly in India: a study of prevalence, factors, and treatment-seeking. *Diabetes Metab Syndr* 2021;15(04):102201
- 13 Qin R, Steel A, Fazel N. Oral mucosa biology and salivary biomarkers. *Clin Dermatol* 2017;35(05):477–483
- 14 Glick M, Greenberg MS, Lockhart PB, Challacombe SJ. *Burket's Oral Medicine*. 13th ed. Hoboken: WILEY Blackwell; 2021 953,1001–1003
- 15 Lalvay Armijos DA, Castañeda Espin AO, Cobos Carrera DF. Anti-hypertensive medication and its adverse reactions in the oral cavity. An integrative review. *Research. Soc Dev* 2022;11(10):1–12
- 16 Bhattacharya PT, Sinha R, Pal S. Prevalence and subjective knowledge of tongue lesions in an Indian population. *J Oral Biol Craniofac Res* 2016;6(02):124–128
- 17 Hamrah MH, Baghalian A, Ghadimi S, et al. The prevalence and correlates of fissured tongue among outpatients in Andkhoy city, Afghanistan: a cross-sectional study. *Clin Cosmet Investig Dent* 2021;13:335–342
- 18 Mahdani FY, Parmadiati AE, Ernawati DS, et al. Prevalence of oral normal variance in healthy elderly patients: a descriptive study on oral pseudo-lesions. *Int Arch Otorhinolaryngol* 2022;26(04):e671–e675
- 19 Mangold AR, Torgerson RR, Rogers RS III. Diseases of the tongue. *Clin Dermatol* 2016;34(04):458–469
- 20 Mahdani FY, Radithia D, Parmadiati AE, Ernawati DS. Prevalence of oral mucosal lesions in geriatric patients in Universitas Airlangga Dental Hospital. *Acta Med Philipp* 2019;53(05):407–411
- 21 González-Álvarez L, García-Pola MJ. Risk factors associated with tongue lesions: a propensity score-matched case-control study. *Med Oral Patol Oral Cir Bucal* 2022;27(01):e25–e34
- 22 Triwardhani L, Dewi SRP. Acute pseudomembranous candidiasis in patients with hypertension. *Sriwijaya Journal of Dentistry*. 2020;1(01):43–51
- 23 Choi HN, Cho YS, Koo JW. The effect of mechanical tongue cleaning on oral malodor and tongue coating. *Int J Environ Res Public Health* 2021;19(01):108
- 24 della Vella F, Lauritano D, Lajolo C, et al. The pseudolesions of the oral mucosa: differential diagnosis and related systemic conditions. *Appl Sci (Basel)* 2019;9(12):2412
- 25 Farah CS, Balasubramaniam R, McCullough MJ. *Contemporary Oral Medicine*. Cham: Springer; 2019:42–43
- 26 Krimadi RNI, Ayuningtyas NF, Parmadiati AE. Normal variant distribution among elderly patients who visited Airlangga University Dental Hospital. *Acta Med Philipp* 2021;55(08):807–810
- 27 Bulsara KG, Cassagnol M. *Amlodipine*. StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023
- 28 Mizuhashi F, Koide K, Toya S, Nashida T. Oral dryness caused by calcium blocker - comparison with saliva of healthy elderly persons and patients with Sjögren's syndrome. *European Society of Medicine* 2017;5(09):
- 29 Ramírez Martínez-Acitores L, Hernández Ruiz de Azcárate F, Casañas E, Serrano J, Hernández G, López-Pintor RM. Xerostomia and salivary flow in patients taking antihypertensive drugs. *Int J Environ Res Public Health* 2020;17(07):2478