The Oral Health Status, Salivary Flow Rate and pH in Hypertensive Patients Who Consume Antihypertensive Drugs in Puskesmas Kasihan I Yogyakarta

Nurvita Risdiana[1][a] and Eka Nuraeni[1][b]
[1]School of Nursing, Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta, Indonesia

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Abstract: Prolonged use of antihypertensive drugs causes side effects, especially in oral health status such as glossodynia (burning sensation in the mouth), xerostomia (dry mouth), swollen salivary glands and pain, changes in taste sensation, gingival overgrowth, changes in salivary pH, and decreased Salivary Flow Rate (SFR). Decreases of SFR affect oral health in hypertensive patients who consume antihypertensive drugs routinely. This research aims to determine the oral health status, SFR, and salivary pH in hypertensive patients who consume antihypertensive drugs routinely. This was a quantitative research with a cross-sectional approach. This study included 63 hypertensive patients in public primary care center (Puskesmas) Kasihan I Yogyakarta who consume antihypertensive drugs routinely at least in the last three months. The data of oral health status were collected using The Oral Health Assessment Tools (OHAT). Oral health status data include SFR, and salivary pH. Univariate analysis using frequency distribution and percentage was conducted to describe the oral health status. There is a change of oral health status in the majority of participants (77.5%) with mean ± SD were 6.00 ± 1.33, low SFR (57.7%) with mean ± SD were 0.153 ± 0.047 and salivary pH quite acidic (80.3%) with mean ± SD 6.188 ± 0.127. Most participants have a change of oral health status (77.5%), low SFR (57.7%) and quite acidic salivary pH (80.3%)

1 INTRODUCTION

Oral health becomes the important determinant for individual quality of life and affects the physical appearance (Koistinen et al., 2020). Oral health is influenced by several factors, one of them is high blood pressure. High blood pressure is one of the most common health conditions found both globally and in Indonesia. Indonesian people. Nearly 30% of adults in the world suffer from high blood pressure. Approximately 31% population of America suffer from high blood pressure and abouy 75 million adults in America suffer from high blood pressure (Nimma et al., 2016). Without massive preventive efforts, about 26% of global population will suffer from high blood pressure in 2025 (Bisnu et al., 2017). The current prevalence of high blood pressure in Indonesia is 34.1% and in Yogyakarta Special Administrative Region, the prevelance is similar to national prevalence aroun 34-35% in 2018 (Pengurus Besar Persatuan Dokter Gigi Indonesia, 2018).

High blood pressure is treated using various antihypertensive drugs. Several commonly used antihypertensive drugs are diuretic drugs, Angiotensin Converting Enzyme (ACE inhibitors) such as captopril, and Calcium-Channel Blockers (CCB) such as Amlodipin.

When consumed for a long time, antihypertensive drugs can cause oral health disruption. The result of the previous study shows that taking antihypertensive drugs can cause dry mouth. The side effects of consuming antihypertensive have been documented which included bleeding and redness of the gingiva (85.35%), hyposaliva (16.99%), and gingival swelling (16.9%) (Mehta et al., 2014)(Kumar et al., 2012). Another study also presents the side effects caused by antihypertensive drugs which were glossodynia (burning sensation in the mouth), xerostomia (dry mouth), pain and oedema in salivary glands, change

[a] https://orcid.org/0000-0003-0684-0556
[b] https://orcid.org/0000-0002-0711-1630

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in taste sensation, gingival overgrowth and decrease in Salivary Flow Rate (SFR). Hypertensive patients tend to have Autonomic Nervous System Imbalance compare with no hypertensive which may affects the saliva condition (Edwards et al., 2011).

The decrease in SFR caused by pharmacodynamics drugs may cause a decrease in heartbeat rate and myocardial contractility. Therefore, the cardiac output will decrease and followed by the decrease of plasma volume which affect the saliva flow rate and the change in saliva pH (Wotulo et al., 2018). The decrease of SFR can cause the decrease of calcium secreted by saliva which lead to demineralization and cause causes dental caries. This will cause disruption in oral health and significant loss of oral cavity health (R. M. Alamsyah, 2015). Other long-term impacts of using antihypertensive drugs on oral health are toothpain and the growth of cariogenic bacteria such as Candida albicans, Lactobacillus, mutant Streptococcus will increase which may cause infections and alter the taste sensation (Rawung et al., 2017).

Based on the background illustrated above, this study aimed to describe the oral health status, salivary flow rate and pH of hypertensive patients who consume antihypertensive drugs regu.

2 MATERIALS AND METHODS

The study was a quantitative descriptive research with the cross-sectional approach to describe the oral health status, the pH of the saliva and the saliva flow rate in patients with high blood pressure who consume antihypertensive drugs.

2.1 Participants

The research population were 250 hypertensive patients of Public Primary Healthcare Center (Puskesmas) Kasihan 1 Yogyakarta in 2019 who consume anti-hypertensive drugs routinely. The samples were 71 patients selected through purposive sampling method based on Slovin formula.

The inclusion criteria were hypertension patients who routinely consume antihypertensive drugs in the last three months and agreed to participate in the study. Patients who were smokers were excluded from the sample as well as for those who did not consume antihypertensive drugs routinely.

2.2 Data Collection

The oral health status was measured using The Oral Health Assessment Tools (OHAT) (Maille et al., 2019), while pH indicator, measuring glass and stopwatch were used to saliva pH and saliva flow rate**.**

2.2.1 The Oral Health Assessment Tools (OHAT)

Oral health status assessment includes several aspects which were lips, tongue, gum and the tissue, saliva, real teeth, false teeth, mouth hygiene, and pain in the teeth(Maille et al., 2019). The score from assessment using OHAT were classified into 0-3 for a healthy category, 4-8 for changes category and 9-19 for unhealthy category (Maille et al., 2019).

2.2.2 pH indicator, Measuring Glass and Stopwatch

pH indicator used to measure the saliva acidity level. The categories of saliva pH consist of very acid (red) with pH <6, moderately acid (yellow) with pH 6.0-6.5 and healthy saliva (green) with pH ≥ 6.75. Measuring glass used to collect and measure the volume of saliva at the same time the duration of saliva collection was measured using stopwatch. The saliva flow rate was calculated by dividing the volume of collected saliva with the duration of collection (ml/minute). The saliva flow rate categorized into normal (0.3-3 ml/minute), low (0.1-0.29 ml/minute), or very low (< 0.1 ml/minute). Saliva flow rate measured using spitting method – in which saliva spat, and it conducted for five minutes and draining method – spitting method in which saliva let to drop by itself (Yendri et al., 2018).

2.3 Data Analysis

To describe the data, univariate analysis was conducted by presenting the data using frequency distribution and percentage

3 RESULTS

The characteristics of participants were described in table 1. Most respondents are elderly (63.4%) with the mean ± SD of age is 60.76 ±3.06. Most respondents are female (80.3%). Most of the respondents have been suffering hypertension for 1-5

years (69%) with the mean 2.08±1.26. The most consumed antihypertensive drugs are amlodipine which is consumed by 42 respondents (59.2%). All respondents take drugs routinely (100%).

Table 1: The Characteristics of Participants.

Category	Mean ± SD	Percentage
Age		
Late adulthood (n=4)	43.00 ± 1.41	5.6
Early Senior (n=22)	52.32 ± 2.19	31
Late Senior (n=45)	60.76 ± 3.06	63.4
Gender		
Female (n=57)	-	80.3
Male (14)	-	19.7
The duration of hypertension		
3-5 month (n=12)	3.38 ± 7.18	16.9
5-11 month (n=6)	6.67 ± 1.63	8.5
1-5 years (n=49)	2.08 ± 1.26	69
5-10 years (n=3)	9.00 ± 1.73	4.2
>10 years (n=1)	11.00 ± -	1.4
Antihypertension drugs		
Amlodipine (n=42)	-	59.2
Captopril (n=29)	-	40.8
Drugs adherence		
Routine (n=71)	71	100

The oral health status of the participants is displayed in table 2. Findings from this study showed that in the majority of the respondents the oral health status was in the category of "change" (78.9%, mean ±SD 5.64 ±1,31), the salivary flow rate was in low category (57.7%; mean ±SD of 0.302 ±0.007), and the pH of saliva was in "moderate acid" (80.3%; mean ±SD of 6.188 ± 0.127).

4 DISCUSSION

Most respondents with high blood pressure were elderly. Age is one of the factors which cannot be modified. Age causes physiological changes human body where blood pressure will increase as human grows older. The increase of blood pressure is caused by arterial wall thickening caused by collagen. which piles up in the muscle layer. Therefore, as people grow older, the arteries will be narrower and stiffer (Amanda & Martini, 2018).

Table 2: Oral Health Status in Hypertensive patients who consume Antihypertension drug.

Category	Mean ± SD	Percentage
Oral Health Status		
Healthy (n=13)	2.54 ± 0.66	18.3
Change (n=56)	5.64± 1.31	78.9
Unhealthy (n=2)	9.33 ± 0.51	2.8
Salivary Flow Rate		
Normal (n=7)	0.302 ± 0.007	9.9
Low (n=41)	0.153 ± 0.047	57.7
Very Low (n=23)	0.030 ± 0.015	32.4
pH Saliva		
Healthy (n=9)	6.833 ± 0.176	12.7
Moderate Acid (n=57)	6.188 ± 0.127	80.3
Very Acid (n=5)	5.700 ± 0.111	7.0

Besides age, gender is also one of the risk factors of high blood pressure which cannot be changed. The findings showed that the percentage of the female who has hypertension is bigger than male. Women tend to have high blood pressure when they reach an elderly age. When younger, females still have high level of estrogen, which has a role in increasing the level of High-Density Lipoprotein (HDL) and has protective effect on high blood pressure (Ramanto Saputra et al., 2017). Menopausal women have a higher risk in experiencing increase in blood pressure compared to men because lower High-Density Lipoprotein (HDL) and higher Low-Density Lipoprotein (LDL) increase blood pressure (Fernandez & Murillo, 2016). Low HDL is one of the causes of arteriosclerosis in which the arteries are shifted and causes high blood pressure in menopausal women (Ramanto Saputra et al., 2017).

Most of the respondents has been suffering from high blood pressure for 1-5 years. These respondents have a long history of high blood pressure and routinely have their health checked at Puskesmas Kasihan 1 Bantul Yogyakarta, as well as routinely consume antihypertensive drugs. However, many respondents admit that they have not practised a healthy lifestyle such as limiting salt intake so that the blood pressure is not fully controlled although most of them routinely consume antihypertensive drugs. Most of the respondents consume amlodipine as the antihypertensive drug. This may be caused by complain from the patients that they do not respond well to captopril and asked for the amlodipine instead.

Finding from the study showed that there are changes in oral health status of the majority of

respondents. This likely due to the decrease of SFR which lead to complaints by patients such as dry mouth, chapped lips, and white layer of tongue, although these conditions are not always noticed by patients. This finding similar to previous study which states that antihypertensive drugs often cause xerostomia, dry mouth and changes in the taste sensation (Villa et al., 2014).

This study showed that most of the hypertensive patients had very low SFR. Antihypertensive drugs both amlodipine and captopril inhibit the calcium ion to enter the heart muscle cells and the smooth muscle of blood vessels and cause muscle relaxation lead to decreases in blood pressure. At the same time, both drugs will suppress water secretion in the salivary gland by closing channel Ca^{2+} so that Cl^- the door is closed, and it cannot come out through acinar cell membranes. Thus, water cannot enter acinar lumen, and hyposalivation will occur in which 99% of the saliva is water. As a result, oral health is disrupted (Asmi Usman & Hernawan, 2017).

Antihypertensive drugs can also decrease SFR by depressing the autonomous nerves, which regulate the salivary gland secretion. The decrease of SFR can also be caused by the lack of natrium in the body. In patients with high blood pressure, natrium intake is limited to assist pharmacological therapy so that it may contribute to the unavoidable decrease of SFR (Zuliasih et al., 2015). This side effect usually takes three months after routine consumption of antihypertensive drugs (Wotulo et al., 2018)

In elderlies, salivary glands can experience atrophic changes, therefore as people aged the atrophic changes can decrease saliva production or hyposalivation, and it can also change some composition of saliva. The atrophic change will lead to the reduction of parenchyma glands and replaced by fat glands and connective tissue (Arsyad, 2017).

The research result indicates that most saliva pH is in the category of very acid. Saliva pH can be changes because of changes in circadian rhythm, age, diet, and secretion rate stimulation (Haryani et al., 2016)). In hypertensive patients, the consumption of antihypertensive drugs will affect autonomous nerves through parasympathetic nerves and decrease the salivary flow rate. The low SFR causes hyposalivation and increase the acidity of the saliva (Nabilla et al., 2019).

5 CONCLUSIONS

Antihypertensive drugs have a contribution to change the Oral Health Status, salivary flow rate and pH in hypertensive patients. Need for further information in the next about how to prevent the negative effect of antihypertensive drugs

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