

Dietary habit of chronic periodontitis patients based on Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia

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ABSTRACT

Introduction: Prevalence of the periodontal disease in Indonesia is 73.1%; one of them is periodontitis. Periodontitis is an inflammation of the tooth-supporting tissue caused by specific microorganisms or a specific group of microorganisms, destroying the periodontal ligament and alveolar bone with increased of clinical attachment loss. Chronic periodontitis patients generally have a poor dietary habit. This study was aimed to describe the dietary habit of chronic periodontitis patients at Universitas Padjadjaran Dental Hospital. **Methods:** The research method used was descriptive survey research. This study's population was diagnosed with chronic periodontitis based on medical records at the Clinics of Periodontics Specialist Program of Universitas Padjadjaran Dental Hospital. The research sample was taken by purposive sampling. The number of samples in this study was taken through the Lemeshow formula A total of 43 research respondents who met the inclusion and exclusion criteria. Respondents were asked to fill out a questionnaire regarding their diet. **Results:** This study showed that the study respondents were averagely consumed three portions of staple food, two portions of side dishes, one portion of vegetables, and one portion of fruits. **Conclusion:** Dietary habit of chronic periodontitis patients are mostly not following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia regarding the types of staple foods, side dishes, vegetables, and fruits.

Keywords: chronic periodontitis; dietary habit; Balanced Nutrition Guidelines.

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INTRODUCTION

Dietary habit is a method or effort in regulating the amount and type of food for specific purposes such as maintain health, nutritional status, and prevent or help the disease healing.¹ The

dietary habit of the Indonesian population is still improper. It is known based on the results of Indonesia Basic Health Research of 2010, which is written in The Republic of Indonesia Health Law No. 41 of 2014.² Enabling the community to form a healthy dietary habit can be performed through

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providing education guidelines for the proportions of primary food groups as a healthy balanced diet.³ The dietary habit guideline used in Indonesia nowadays is Balanced Nutrition Guidelines. Balanced Nutrition Guidelines is visualised in the form of a rounded pyramid-like shape (*Tumpeng Gizi Seimbang*). There are recommendations for daily food consumption in the form of 3-4 servings of staple foods, 3-4 servings of vegetables, 2-3 servings of fruits, and 2-4 servings of side dishes. One serving of staple food is equivalent to $\frac{3}{4}$ glass or 100 grams of rice, one serving of vegetables is equivalent to 1 glass or 100 grams of vegetables, one serving of fruit is equivalent to 1 piece or 50 grams of Ambon banana, vegetable side dishes equivalent to 2 medium slices or 50 grams of tempeh, and animal side dishes are equivalent to 1 medium slice or 35 grams of meat.⁴

Periodontal disease is a worldwide oral health problem; generally, 50% of the human population experiences at least one form of periodontal disease.⁵ The prevalence of chronic periodontitis in the adult population worldwide is 30-35%.⁶ The prevalence of periodontitis in Indonesia is 73.1%.⁷ Chronic periodontitis is an inflammation of the tooth-supporting tissue causes attachment and gradual bone loss.⁸ Maintaining health and avoiding various chronic diseases can be taken by improving balanced nutrition consumption. A good nutritional state will be able to improve the health of individuals and communities.⁹ Therefore, dietary habit plays an essential role in the health of the periodontal tissues.

A healthy dietary habit can prevent periodontitis. The previous study showed that individuals who maintain a healthy diet are less likely to have periodontitis.¹⁰ Observational studies have shown a strong association between the consumption of vegetables and fruit and other antioxidant nutrients and oral health-related quality of life in adults. This effect is mainly related to its function in reducing oxidative stress and inflammation and associated with the consumption of β -carotene, vitamin C, α -tocopherol, and omega-3 fatty acids.¹¹ This study was aimed to describe the dietary habit of chronic periodontitis based of Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia .

METHODS

The research method used was descriptive survey research. This study's population was diagnosed with chronic periodontitis based on medical records at the Clinics of Periodontics Specialist Program of Universitas Padjadjaran Dental Hospital. The research sample was taken by purposive sampling. The number of samples in this study was taken through the Lemeshow formula because the population was unknown, namely by dividing the confidence level squares (Z) of 1.96 times the expected prevalence (P), 50% or 0.5 times the result of subtracting one. The expected prevalence (P) was then divided by the square of precision (d), which was 0.1517. The number of samples obtained was 43 respondents who met the inclusion and exclusion criteria.

The inclusion criteria were male or female patients, aged 35-49 years, and able to read and write. The exclusion criteria of this study sample consisted of patients with diabetes mellitus, cardiovascular/cerebrovascular disease (hypertension, coronary heart disease, stroke, HIV, and pregnant patients. The tools and materials needed in this study, including medical records of chronic periodontitis patients, informed consent forms, questionnaire sheets, and stationery.

Before conducting the research, the researcher prepared a permit letter to the Universitas Padjadjaran Dental Hospital's ethical committee. This study received permission from the Health Research Ethics Commission of the Faculty of Medicine Universitas Padjadjaran, with license No. 430 / UN6.C.10 / PN / 2017 and from Universitas Padjadjaran Dental Hospital with license No. 79 / UN6.8.17 / PL / 2017. Researchers also made informed consent and a questionnaire. The questionnaire used in this study was a modified EPIC-Norfolk food frequency questionnaire, by replacing the food list in the original questionnaire with the Food Exchange List from The Republic of Indonesia Health Law No. 41 of 2014.¹²

The validity and reliability of the questionnaire were tested on 30 respondents. These tests were used using a list of questions in the questionnaire to see the questionnaire's feasibility. The questions were used to retrieve data. The validity test was used to determine the feasibility of items in the list of questions in

defining a variable. This questionnaire generally supports a particular group of variables. The validity test should be performed on each item of the question. The r_{count} was then compared with r_{table} , where the $df = n-2$ with sig of 5%. If the $r_{\text{table}} < r_{\text{count}}$, then the questionnaire will be considered valid. By using as many as 30 respondents, the r_{table} value was 0.312. The validity test was conducted using the Product Moment correlation technique.

Reliability is a measure of respondents' stability and consistency in answering matters relating to question constructs, which are the dimensions of a variable and arranged in the form of a questionnaire. The reliability test was carried out by using the Cronbach alpha test. Reliability test can be carried out jointly on all question items. The validity test results showed that the table coefficient was smaller than the calculated coefficient; thus, the questionnaire was valid. The reliability test results showed that the alpha value was less than 0.60; thus, the questionnaire was reliable.¹³

The first research step was to explained the study's purpose and asked the research respondents to fill out an informed consent as evidence of consent to the study. The research respondents were then asked to fill out a questionnaire sheet according to the researchers' instructions. This questionnaire asks for data regarding smoking habits and the history of the patient's illness and dietary habits. Data on the patient's dietary habits were obtained through the food frequency questionnaire which contained the frequency of staple food, vegetables, fruit, and side dishes consumption by the patient at one eating time and in a day. Patients were asked to put a checkmark on each food in the questionnaire list based on the frequency consumption of these foods which can be never; less than once a month; 1-3 times a month; once a week; 2-4 times a week; 5- 6 times a week; once a day; 2-3 times a day; 4-5 times a day; more than 6 times a day; then write down the total consumption for each meal in the column provided.

After completing the questionnaire filling, the researcher then rechecked the respondents' answers according to the questionnaire. The researcher asked whether there was any data that has not been filled priorly. All data that has been filled in entirely will be processed using the SPSS

software. The data obtained will be described and presented in the form of a frequency distribution table and percentage.

RESULTS

The respondents' characteristics in this study are presented in Table 1, which shows that of the 43 research respondents, 22 (51.2%) were male, and 21 (48.8%) were female. Based on the age range, the sample with the most considerable age was the 45-49 years age group, which was 24 people (55.8%). Research respondents with smoking habit was found in 14 individuals (32.6%), and study respondents with no smoking habit was found in 29 individuals (67.4%) pada tabel 1.

Table 1. Research respondents' characteristics

Variable		Number	%
Sex	Female	21	48.8%
	Male	22	51.2%
	Total	43	100%
Age (years)	35-39	10	23.3%
	40-44	9	20.9%
	45-49	24	55.8%
	Total	43	100%
Smoking habit	Yes	14	32.6%
	No	29	67.4%
	Total	43	100%

Table 2 indicates that the research respondents who consumed the staple foods according to the recommendations of the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia were 20 individuals (46.5%); 20 individuals (46.5%) consumed the side dishes following the recommendation; 2 individuals (4.7%) consumed vegetables following the recommendation; 8 individuals (18.6%) consumed fruits following the recommendation. The average daily consumption of staple foods was three servings, one serving of side dishes, one serving of vegetables, and one serving of fruits, respectively.

Most research respondents (97.7%) (42 individuals) chose white rice as a staple food to be consumed every day, 2-3 times a day. Other staple foods consumed every day were white bread (16.3%) (7 individuals) and oatmeal (4.7%) (2 individuals), once a day for both. Another

Table 2. Types and frequency of food consumption

Food type	Food consumption frequency																			Total	
	Never or,1/ month		1-3x/ month		1x/week		2-4x/ week		5-6x/ week		1x/day		2-3x/day		4-5x/ day		>6x/ day				
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	
Staple food																					
White rice	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	42	97.7	1	2.3	0	0.0	43	100	
Noodle	5	11.6	18	41.9	10	23.3	10	23.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
White bread	4	9.3	13	30.2	8	18.6	10	23.3	0	0.0	7	16.3	1	2.3	0	0.0	0	0.0	43	100	
Cassava	28	65.1	8	18.6	6	14.0	1	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Potato	22	51.2	7	16.3	6	14.0	8	18.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Oatmeal	36	83.7	2	4.7	7	16.3	1	2.3	0	0.0	2	4.7	0	0.0	0	0.0	0	0.0	43	100	
Animal side dishes																					
Beef	5	11.6	15	34.9	14	32.6	9	20.9	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Chicken meat	1	2.3	2	4.7	7	16.3	19	44.2	2	4.7	9	20.9	3	7.0	0	0.0	0	0.0	43	100	
Chicken eggs	1	2.3	2	4.7	9	20.9	17	39.5	2	4.7	9	20.9	3	7.0	0	0.0	0	0.0	43	100	
Fresh fish	8	18.6	8	18.6	10	23.3	13	30.2	1	2.3	3	7.0	0	0.0	0	0.0	0	0.0	43	100	
Salted fish	26	60.5	8	18.6	6	14.0	2	4.7	0	0.0	1	2.3	0	0.0	0	0.0	0	0.0	43	100	
Vegetable side dishes																					
Tofu	0	0.0	1	2.3	3	7.0	16	37.2	2	4.7	9	20.9	9	20.9	3	7.0	0	0.0	43	100	
Tempeh	0	0.0	1	2.3	3	7.0	20	46.5	2	4.7	8	18.6	6	14.0	3	7.0	0	0.0	43	100	
Oncom	37	86.0	6	14.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Vegetables																					
Water spinach	12	27.9	11	25.6	14	32.6	6	14.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Cucumber	19	44.2	9	20.9	7	16.3	4	9.3	0	0.0	3	7.0	1	2.3	0	0.0	0	0.0	43	100	
Tomato	16	37.2	5	11.6	7	16.3	4	9.3	0	0.0	11	25.6	0	0.0	0	0.0	0	0.0	43	100	
Cauliflower	22	51.2	4	9.3	11	25.6	3	7.0	0	0.0	1	2.3	2	4.7	0	0.0	0	0.0	43	100	
Lettuce	27	62.8	4	9.3	6	14.0	3	7.0	0	0.0	2	4.7	1	2.3	0	0.0	0	0.0	43	100	
Spinach	14	32.6	8	18.6	13	30.2	8	18.6	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Bean	16	37.2	6	14.0	10	23.3	6	14.0	0	0.0	4	9.3	1	2.3	0	0.0	0	0.0	43	100	
Carrot	9	20.9	2	4.7	15	34.9	11	25.6	0	0.0	5	11.6	1	2.3	0	0.0	0	0.0	43	100	
Fruits																					
Red apple	10	23.3	16	37.2	12	27.9	4	9.3	0	0.0	1	2.3	0	0.0	0	0.0	0	0.0	43	100	
Grape	18	41.9	18	41.9	6	14.0	0	0.0	0	0.0	1	2.3	0	0.0	0	0.0	0	0.0	43	100	
Water apple	34	79.1	6	14.0	3	7.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Sweet orange	8	18.6	11	25.6	12	27.9	10	23.3	0	0.0	2	4.7	0	0.0	0	0.0	0	0.0	43	100	
Mango	26	60.5	6	14.0	6	14.0	3	7.0	0	0.0	2	4.7	0	0.0	0	0.0	0	0.0	43	100	
Pineapple	31	72.1	10	23.3	1	2.3	1	2.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Papaya	9	20.9	9	20.9	9	20.9	8	18.6	1	2.3	7	16.3	0	0.0	0	0.0	0	0.0	43	100	
Ambon banana	5	11.6	4	9.3	7	16.3	11	25.6	1	2.3	13	30.2	2	4.7	0	0.0	0	0.0	43	100	
Rambutan	39	90.7	4	9.3	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Melon	25	58.1	11	25.6	5	11.6	2	4.7	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	43	100	
Watermelon	21	48.8	12	27.9	7	16.3	2	4.7	0	0.0	1	2.3	0	0.0	0	0.0	0	0.0	43	100	

Notes: n= Number of research respondents; %= Percentage of research respondents

staple foods such as noodles was consumed as much as once and 2-4 times a week often, by ten individuals respectively (23.3%). Oatmeal (83.7%) (36 individuals), cassava (65.1%) (28 individuals), and potatoes (51.2%) (22 individuals)

were never consumed or only consumed less than once a month. 20.9% of research respondents (9 individuals) chose chicken meat and chicken eggs as daily consumed animal side dishes consumed once a day. Other animal side dishes chosen

were fresh fish (7%) (3 individuals) and salted fish (2.3%) (1 individual) with the same frequency consumption. The beef was not chosen to be consumed every day. However, 32.6% of them (14 individuals) consumed it once a week, and 34.9% consumed it 1-3 times per month (15 individuals). in table 2

Tofu was a vegetable side dish mostly chosen for daily consumption, with a frequency of once a day, 2-3 times a day, or 4-5 times a day. Other vegetable side dishes were tempeh, with a frequency of once a day (8 individuals (18.6%)) and 2-3 times a day (6 individuals (14%)). Most of them (86%) (37 individuals) never, or less than once a month, consumed oncom. Only six individuals (14%) took it 1-3 times a month.

Tomato was the type of vegetable mostly chosen for daily consumption, once a day (11 individuals (25.6%)), followed by carrots, beans, cucumber, lettuce, and cauliflower. Other vegetables, such as water spinach, were often consumed only 2-4 times a week (6 individuals (14%)).

Ambon banana was the type of fruit most chosen for daily consumption, once a day 30.2% and 2-3 times a day (2 individuals 4.7%, followed by papaya, sweet oranges, mango, red apple, grape, and watermelon. Other fruits, such as pineapple, were often consumed only 2-4 times a week 2.3%, while most of the study individuals 72.1% never consumed pineapple or less than once a month. The most frequent consumption of melons was 2-4 times a week 2.3%, and most of the respondents (58.1%) never consumed them, or less than once a month. Water apple and rambutan were the fruit types that most respondents chose

Table 3. The average amount of daily consumption and the suitability of the dietary habit with the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia

Food type	Average amount of daily consumption	Category			
		Suitable		Unsuitable	
		n	%	n	%
Staple food	2.596	20	46.5	23	53.5
Side dishes	1.930	20	46.5	23	53.5
Vegetables	0.930	2	4.7	41	95.3
Fruits	1.213	8	18.6	35	81.4

never to consume or only consumed less than once a month, with a percentage of 79.1% and 90.7%, respectively.

Based on data presented in Table 3, on a daily average, the respondents consumed three servings of staple food, two servings of side dishes, one serving of vegetables, and one serving of fruits. The research respondents who consumed staple foods following the recommended Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia were 46.5%, proper consumption of side dishes of 46.5%, proper consumption of vegetables was found 4.7%, and proper consumption of fruits was found in 18.6%.

Table 4 shows that respondents with smoking habit who consumed the staple foods according to the recommendation of the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia were 23.3%. In comparison, appropriate consumption side dishes was found in 23.3%, appropriate consumption of fruits was found in 7.0%. None of the respondents with a smoking habit consumed vegetables following the Balanced Nutrition Guidelines' recommendation

Table 4. The suitability of the dietary habit with the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia based on the subjects' sex and smoking habit

Type of food	Category	Smoking habit				Sex			
		No		Yes		Male		Female	
		n	%	n	%	n	%	n	%
Staple food	Suitable	10	23.3	10	23.3	13	30.2	7	16.3
	Unsuitable	19	44.2	4	9.3	9	20.9	14	32.6
Side dishes	Suitable	10	23.3	10	23.3	10	23.3	10	23.3
	Unsuitable	19	44.2	4	9.3	12	25.6	11	25.6
Vegetables	Suitable	2	4.7	0	0.0	1	2.3	1	2.3
	Unsuitable	27	62.8	14	32.6	21	48.8	20	46.5
Fruits	Suitable	5	11.6	3	7.0	3	7.0	5	11.6
	Unsuitable	24	55.8	11	25.6	19	44.2	16	37.2

from the Ministry of Health of the Republic of Indonesia (0.0%).

Table 4 shows that the consumption of staple foods under the Balanced Nutrition Guidelines' recommendation from the Ministry of Health of the Republic of Indonesia was more commonly found in male respondents, which was found in 30.2%. While the appropriate consumption of side dishes was found more in female respondents 32.6%, appropriate consumption of vegetables was found in 2.3%, both male and female respondents. Consumption of fruits following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia was found more in female respondents, found in 11.6%.

DISCUSSION

This study used a questionnaire for 43 chronic periodontitis patients at the Clinics of Periodontics Specialist Program of Universitas Padjadjaran Dental Hospital, selected through the purposive sampling method. The research results regarding the dietary habit based on the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia, specifically on the daily consumption of staple foods, showed that white rice was consumed more often than other types of staple food, followed by white bread, noodles, potatoes, cassava, and oatmeal. The average consumption of staple foods was three servings per day. This result was following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia.

Based on the Balanced Nutrition Guidelines diet concept, the recommended amount of staple food consumption in a day is 3-4 servings.² This is due to the Indonesian habit to consider white rice as a staple food. People will use another staple food found in their surroundings according to their needs if white rice cannot be found. This condition is also corroborated by Quetulio-Navarra¹⁴, who states that staple food consumption is based on availability in the area concerned, which generally comes from family farming and develops into food habits in a particular area. The pattern of staple food stuffs in West Java is a rice-eating habit, in which the consumption of carbohydrates derived from rice dominates more than 90% of the total carbohydrate calory intake.¹⁵ Although as many

as 20 of the 43 respondents consumed staple foods according to the recommendation of the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia, the types of staple foods that are often consumed, such as white rice, white bread, noodles, potatoes, and cassava, contain simple carbohydrates, which is not suitable for the periodontal tissue because they contribute in aggravating inflammation.

A previous study on the participants who were asked to do a stone-age diet for four weeks, which is a diet with low simple carbohydrate and rich antioxidant and fibre micronutrients, showed significant reductions of gingival and periodontal inflammation, even though the plaque scores might increase because they are instructed not to perform oral hygiene.¹⁶ The results of previous studies demonstrated a direct effect of nutrition and periodontal inflammation.¹⁶ It is essential to know that diet also interacts with other risk factors associated with periodontal disease. For example, in uncontrolled cases of type 2 diabetes, a low simple carbohydrate diet helps prevent chronic hyperglycemic conditions that affect the severity of periodontitis.¹⁷ Vitamin B or thiamine is one of the vitamins necessary for the health of periodontal tissues. Vitamin B plays a role in metabolism, repair, and cell proliferation.¹⁸ One source of vitamin B widely available in Indonesia is rice. Thiamine plays a role in carbohydrate metabolism. Thiamine is actively absorbed mainly in the upper duodenum, which is acidic, with sodium-dependent adenine triphosphatase (ATPase). Some of the thiamine consumed more than 5 mg/day will be absorbed passively. Active absorption is inhibited by alcohol. After absorption, approximately 30 mg of thiamine undergoes phosphorylation and is stored as thiamine pyrophosphate (TPP) in the heart, brain, liver and muscle tissue. In the blood circulation, free-formed thiamine only found in the small amounts. Thiamine excreted through urinate mostly in the whole form and the small proportion in metabolites form, especially diphosphate and disulfite.

Mashed/half milled cereals from brown rice and oatmeal have a higher thiamine content than milled cereals or white rice.¹⁹ Therefore, the consumption of staple foods such as brown rice can be a better choice than white rice for chronic

periodontitis patients to support the repair of their periodontal tissues.

This study showed that chicken meat was the most frequent animal side dishes consumed daily, followed by chicken eggs, fresh fish, beef, and salted fish. Meanwhile, tofu was the most frequent vegetable side dishes consumed daily, followed by tempeh and oncom. These patterns might be caused by the affordability factor of the food choice for Indonesians. The average consumption of side dishes was two servings per day, following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia to consume 2-4 servings of side dishes daily.² According to Hujoel et al.²⁰, protein consumption can maintain gingival tissue, one of the highest turnover rates in the human body. Research by Adegboye et al.²¹ showed an inverse relationship between high protein consumption and periodontitis. Protein functions, among others, help the growth and maintenance of tissue and form antibodies. The human body's ability to fight infection depends on its ability to produce antibodies against the organisms that cause a particular infection or allergens entering the body. In a protein deficiency state, the body's ability to block toxic substances' toxic effects is reduced.²² Fish is a good protein source. However, in this study, as animal side dishes, it was not a preferred option over poultry products because poultry products are easier to obtain, more affordable, more comfortable to process, and more varied in processed products. Fish can substitute foods with high saturated fat, such as meat.²³

The content of unsaturated fatty acids in fish has an omega-3 configuration proven to have anti-inflammatory substances and protects periodontal tissues from pathogenic bacteria.²⁴ In addition to animal protein sources, vegetable protein such as lentils also have benefits for periodontal tissues because they contain vitamin E. Vitamin E or tocopherols are essential antioxidants for the body. They have a structural function in maintaining the integrity of cell membranes. As much as 20-80% tocopherol is absorbed in the upper part of the small intestine in the form of micelles whose formation depends on bile salts and pancreatic lipase. The absorption of tocopherols appears to be assisted by medium-chain triglycerides and is inhibited by long-chain polyunsaturated fatty

acids. The mechanism of transport of the small intestine mucosa into the lymph system is carried out by chylomicrons to be carried to the liver. From the liver, alpha-tocopherol is transported by the very low-density lipoprotein/VLDL into the plasma, while most of the gamma-tocopherol is excreted through the bile. Tocopherol in plasma is then accepted by peripheral cells with low-density lipoprotein/LDL receptors and enter the cell membrane. Tocopherols accumulate in the cell parts where free radicals' production is mostly formed, namely mitochondria and endoplasmic reticulum.²⁵ Sources of vitamin E are, amongst others, tempeh, tofu, palm oil, and bean sprouts.²⁶ Tempeh and tofu are examples of foods made from soybeans. Research conducted by Palaska et al.²⁷ showed an inverse relationship between soybeans and isoflavones and periodontal disease prevalence in female students aged 18-22 years in Japan.

Tomatoes were the most often consumed vegetable every day, followed by carrots, beans, spinach, water spinach, cucumber, cauliflower, and lettuce. In Indonesia, this vegetable group is easy to find, affordable, and easy to process. In this study, the average daily consumption of vegetables for most respondents was one serving per day. This result, however, was not following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia, which recommends 3-4 servings of daily vegetable consumption.² Most of the respondents frequently consumed Ambon banana as a daily fruit menu, followed by papaya, sweet orange, red apple, mango, grape, melon, pineapple, guava, and rambutan. In this study, the average daily consumption of vegetables for most respondents was one serving per day. This result, however, was not following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia, which recommends 2-3 servings of daily fruit consumption. Besides being easy to find, affordable, and easy to process by Indonesians, fruits such as bananas and papayas are widely grown in household yards.

Consumption of vegetables and fruits of respondents in the present study was still below the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia, even though they are essential for periodontal tissue. Fruits and vegetables are the primary sources of fibre,

carotene, and water-soluble vitamins such as vitamin C and folic acid.²⁸ Vitamin C is generally only found in vegetables and fruits, especially acidic ones, such as oranges, pineapples, rambutan, papaya, plum mango (gandaria), and tomatoes. Vitamin C is also found in many leafy vegetables and types of cabbage. Vitamin C is easily absorbed by diffusion in the upper part of the small intestine and then enters the bloodstream through the portal vein. Vitamin C is then carried to all tissues. The highest concentration is in the adrenal, pituitary and retinal tissues. Consumption beyond the saturation level of various tissues is excreted through the urine in oxalic acid. On consumption exceeding 100 mg daily, it will be excreted as ascorbic acid or as carbon dioxide by breath. The body's vitamin C status is determined by clinical signs and vitamin C measurements in the blood. Clinical signs include gingival bleeding and bleeding into the skin. Vitamin C functions include helping the formation of collagen, helping calcium absorption, and preventing infection.²⁹

A diet rich in vegetables and vitamin C previously shows a positive association with improved periodontal health and a negative relationship with periodontal disease progression in a malnourished population.^{30,31} Sufficient antioxidants through the diet to keep tissues healthy are necessary to reduce free radicals' unwanted effects. These findings suggested the critical role of antioxidants in periodontal health.³² Apart from vitamin C, antioxidants are also obtained from carotene. Digestion and absorption of carotene and retinoids require bile and pancreatic enzymes as well as fat. Vitamin A in food is mostly present in retinyl esters, along with carotenoids mixed with other lipids in the stomach. In the small intestinal mucosal cells, retinyl ester is hydrolysed by pancreatic esterase enzymes to become retinol which is more efficiently absorbed than retinyl ester. Some carotenoids, especially beta-carotene in the intestinal mucosal cells' cytoplasm, are broken down into retinol. Retinol in the small intestine mucosa reacts with fatty acids and forms esters, and with the help of bile cross the villi cells of the small intestine wall to be transported by chylomicrons through the lymph system into the bloodstream to the liver. The liver acts as a significant store of vitamin A in the body. Approximately one-third of all carotenoids

in the diet are converted into vitamin A. Some of the carotenoids absorbed unchanged and entered the bloodstream in the form of carotene. As much as 15-30% of carotenoids in the blood are beta-carotene, and the rest are non-vitamin carotenoids. These carotenoids are transported in the blood by various forms of lipoproteins. Carotenoids are stored in the fat tissue and adrenal glands.³³ Sources of carotene are dark green vegetables and yellow-orange fruits, such as cassava leaves, peanut leaves, water spinach, spinach, yardlong beans, green beans, carrots, tomatoes, yellow corn, papaya, mango, ripe jackfruit, and oranges.³⁴

Various factors can cause a low consumption of vegetables and fruits. According to Kuswardhani et al.³⁵, West Java Province is the largest producer of vegetables and fruits among all other provinces. However, the actual consumption of the population is in the second-lowest rank in Indonesia. Low consumption of vegetables and fruits can be caused by the development of instant and processed foods and beverages with similar nutrients as vegetables and fruit (for example, fibres and vitamins). Also, people may not know the benefits and properties of vegetables and fruits found around them. Another factor can be caused by the possibility that respondents of this present study mostly not native West Javanese (Sundanese people) because Sundanese prefer to eat vegetables.

Chronic periodontitis patients should consume a healthy diet, as recommended by the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia. Research conducted by Van der Velden et al.³⁶ suggested that a diet rich in vegetables, fruits, lentils, and dairy products as the sole intervention can improve the pocket depth and gingival inflammation in periodontitis patients with metabolic syndrome.³⁰ The 2011 European Workshop on Periodontology recommendation advises dentists to encourage patients to increase their consumption of fish oil, fibre, fruit and vegetables, and reduce consumption of simple carbohydrates such as white rice, noodles, and potatoes as part of the prevention and treatment of periodontal disease and general health.³⁷ The pattern of food consumption in a society is influenced by various factors, namely geographic, economic, cultural, and government

policies related to the availability and food production, as well as public awareness of healthy food.³⁸ Incompatibility of the respondents' dietary habits with the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia might be caused by their ignorance, low-level income, and the unavailability of healthy food in their neighbourhood.

This present study also indicated that there were still found chronic periodontitis respondents who consumed food following the recommendations of the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia. This result showed that chronic periodontitis was not solely influenced by nutritional factors or dietary habit but also by other factors. The main factor of periodontitis is poor oral hygiene habits. Other influencing factors include unknown systemic diseases such as diabetes mellitus, smoking habits, genetic disorders, and stress.³⁹

The dietary habits of chronic periodontitis patients at the Universitas Padjadjaran Dental Hospital University were mostly not following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia in terms of the types of staple foods, side dishes, vegetables, and fruits. One of the limitations of the present study was the need for researcher patience in guiding respondents by repeating questions to dig up memories regarding their food consumption to obtain honest and accurate answers to provide information of the frequency and amount of their actual food consumption.

CONCLUSION

Dietary habit of chronic periodontitis patients are mostly not following the Balanced Nutrition Guidelines from the Ministry of Health of the Republic of Indonesia regarding the types of staple foods, side dishes, vegetables, and fruits.

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