THE EFFECT OF GIVING GUAVA AND AVOCADO JUICE AND NUTRITIONAL COUNSELING ON CHOLESTEROL LEVELS IN PRE-ELDERLY HYPERCHOLESTEROLEMIA AT SUKAMERINDU HEALTH CENTER BENGKULU

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ABSTRACT

An unbalanced lifestyle such as consumption of foods high in fat, cholesterol and insufficient fiber intake can trigger hypercholesterolemia. One of the non-pharmacological therapies to reduce cholesterol levels is by using foods that are high in fiber and antioxidants such as red guava and avocado. Guava contains vitamin C, carotenoids and pectin which are useful in lowering cholesterol levels. Avocados contain omega-9 which can lower cholesterol in the blood. The aim was to examine the effect of guava and avocado juice and nutritional counseling on cholesterol levels in hypercholesterolemia in the elderly at the Sukamerindu Health Center. Quasi-experimental is a method used with pre-test and post-test design. The study population was elderly aged 45-59 years at the Sukamerindu Health Center. The number of respondents used was 20 respondents. 10 people in the intervention group consumed a combination of guava and avocado juice and nutrition counseling, and 10 people in the control group received nutrition counseling which were taken by purposive sampling. The treatment given was a combination of 300 ml of guava and avocado juice for 7 consecutive days. Analysis using the Wilcoxon test showed that giving guava and avocado juice and nutritional counseling had a significant effect on cholesterol levels before and after treatment, with p0.005 (<0.05), mean 42.6 mg/dl. Provision of juice combination of red guava and avocado can be used as an alternative functional food ingredients to reduce cholesterol. It is strongly recommended that to add lifestyle intervention such as hope impact exercise or jogging in order.

Keywords: red guava, avocado, cholesterol levels

INTRODUCTION

Health problems resulting from an unbalanced diet and lifestyle are caused by increasingly sophisticated developments. A sedentary lifestyle, excessive consumption of foods high in fat and cholesterol and a lack of fiber intake can trigger degenerative diseases, one of which is hypercholesterolemia.[1] Hypercholesterolemia is a pathological condition caused by abnormalities in cholesterol metabolism in the blood whose levels exceed normal limits.[2]

The prevalence rate of hypercholesterolemia sufferers in parts of the world continues to increase. According to the *World Health Organization* (WHO) in 2014 states that the high cholesterol rate is around 48 percent in the United States and 54 percent in Europe. Results of Riskesdas data (2018), Indonesian hypercholesterolemic patients with borderline and high total cholesterol levels are more common in women, by 24 percent and 9.9 percent and 18.3 percent and 5.4 percent respectively for males.[3]

Causes of hypercholesterolemia include a high cholesterol diet, the aging process, genetic factors, and decreased estrogen levels in postmenopausal women. The incidence of hypercholesterolemia in women before menopause is lower than men.[4] Management of hypercholesterolemia can be done with pharmacological and non-pharmacological therapy that can be used to prevent and reduce high cholesterol levels. One of the non-pharmacological therapies in the management of hypercholesterolemia is using types of vegetables and fruits that contain high fiber and antioxidants.[5] Red guava *(Psidium guajava)* has nutritional content that can reduce total cholesterol and blood triglyceride levels. Guava's are rich in nutrient, such as vitamin C, potassium, and iron. Guava is also rich in dietary fiber, especially pectin (a water- soluble dietary fiber), carotenoid components, and polyphenols. Guava's contain no saturated fat or sodium, and are low in fat and energy.[6] Fiber itself is a nutrient that helps stabilize blood sugar and is able to produce a longer feeling of fullness. The benefits of fiber in guava fruit are lowering cholesterol by binding to cholesterol and bile acids in the body and helping to excrete them.[7]

Avocados contain 20-30 times more fat than other fruits, namely unsaturated fatty acids. Avocados are rich in protein, riboflavin, niacin, potassium, vitamin C. A decrease in LDL (*Low Density Lipoprotein)* and an increase in LDL (*High Density Lipoprotein*) can occur because the omega-9 oleic acid in avocados causes the disposition of fat in the body to become depressed. Avocados also contain niacin, which can increase HDL cholesterol. Lowering LDL and increasing HDL leads to smooth blood circulation and prevents arteriosclerosis.[8] Bioactive compounds in avocados, such as beta-sitosterol can lower cholesterol levels.[9]

Many studies have used guava and avocado as an alternative in lowering cholesterol levels, but so far the role of the combination of guava and avocado juice in reducing cholesterol levels has not been known, especially in Bengkulu City, researchers are therefore in studying the effects of giving a combination of guava and avocado juice on cholesterol levels in elderly patients with hypercholesterolemia at the Sukamerindu Health Center in Bengkulu.

RESEARCH METHODS

The design used is a quasi-experimental design with pre-test and post-test. Implementation in this study by dividing into 2 treatments, namely 1 intervention group was given nutrition counseling and a combination of 300 ml of red guava and avocado juice for 7 consecutive days and 1 control group that was given nutritional counseling 2 times at the beginning of the examination and at the end inspection. The place and time of this research was in the Sukamerindu Health Center in Bengkulu which was carried out in April 2023. Sampling using purposive sampling with the number of respondents 20 people. The tools used to collect data include Easy touch GCU and interviews. The materials used in this study were 150 grams of red guava, 100 grams of avocado and 100 grams of cooking water. The bivariate analysis used in this study is the Wilxocon Signed Rank test to measure the difference between 2 groups of paired data. The ethics committee of the Bengkulu Ministry of Health Polytechnic has approved this research with Number KEPK/157/04/2023 on April 14, 2023.

RESULTS

Respondents in this study were elderly aged 45-59 years old in the Sukamerindu Health Center, Bengkulu City. Respondent characteristics include age, gender, occupation, education, knowledge and physical activity.

Table 1
Distribution of Individual Characteristics

Variable	Intervention		Control		*p*
	f	%	f	%	
Age					
45-51	1	10,0	8	80,0	0,002
52-59	9	90,0	2	20,0	
Gender					
Man	5	50,0	0	0,0	0,010
Woman	5	50,0	10	100,0	
Work					
Work	7	70,0	4	40,0	0,178
Doesn't work	3	30,0	6	60,0	
Education					
Low	2	20,0	1	10,0	0,531
Tall	8	80,0	9	90,0	
Knowledge					
Good	6	60,0	10	100,0	0,025
Enough	4	40,0	0	0,0	
physical activity					
Very Light	5	50,0	3	30,0	0,361
Light	5	50,0	7	70,0	

Table 1. Characteristics by age in the intervention group was mostly 52-59 years old (90%) and the control group was mostly 45-51 years old (80%). The characteristics of respondents based on gender in the intervention group were equally male and female, each 50 percent and in the control group all respondents were female. In the intervention group of respondents who worked as much as 70 percent, while for the control group who worked as much as 40 percent. Characteristics based on education in the intervention group had the most high education, namely as much as 80 percent, and 20 percent low, while for the control group who had higher education, namely 90 percent, and 10 percent low. Frequency distribution of respondents based on knowledge of intervention group who had good knowledge was 60 percent, and 40 percent was sufficient. While the control group has a good knowledge of 100 percent. The intervention group had 50 percent light activity and 50 percent very light, and the control group had 70 percent light physical activity and 30 percent very light.

In table 2 above it is known that cholesterol levels before the intervention group obtained an average figure of 258.0 mg/dl, SD 45.1, minimum 216 , maximum 371, while after the intervention was given an average of 215.4 mg/dl, SD 29.5, minimum 169, maximum 264. As for the control group cholesterol levels before with an average of 242.1 mg/dl, SD 36.7, a minimum of 205, a maximum of 304. While in the control group on the after variable, namely an average of 230.7 mg/dl, SD 36.9, a minimum 182, maximum 281. From the table above, we can see that the intervention group had an average fat intake 32.5 gr, SD 11.2. While the average fat intake of the control group was 39.3 gr, SD was 9.9 (table 3).

Table 2
Overview of Cholesterol Levels Before and After

Cholesterol levels	Before			After		
	Mean	Std	Min±Max	Mean	Std	Min±Max
Intervention	258.0	45.1	216±371	215.4	29.5	169±264
Control	242.1	36.7	205±304	230.7	36.9	182±281

Table 3
Patient's Fat Intake Overview

Variable	Intervention			Control		
	Mean	Std	Min±Max	Mean	Std	Min±Max
Fat Intake	32.5	11.5	18.3±47.9	39,3	9,9	31.2±61.1

Table 4
Effect of Giving Guava and Avocado Juice and Dietary Advice on Cholesterol Levels

Variable	Intervention		*P*	Control		*P*
	Before Average	After Average		Before Average	After Average	
Cholesterol levels	262.5[a]± 45.1	211.5 [a]±29.5	0.005[b]	242.1[c]±36.7	230.7[c]±36.9	0.415d –

note : a = Median ± Standard Deviation *c = Mean* ± Standard Deviation
b = Wilcoxon Signed Ranks Tests *d = Paired T Test*

Table 5
Differences in Giving Guava and Avocado Juice and Nutrition Counseling on Cholesterol Levels

Cholesterol levels	n	Mean±SD	*P*
Intervention Group	10	51 ±15.6	0.005
Control Group	10	11.4 ±-0.2	0.415

Table 4 above shows cholesterol levels in the treatment group with (p <0.05) and an average of 262.5 mg/dl in the upper category (>240 mg/dL), and decreased to 211,5 mg/dL at the limit (200 to239 mg/dL). In the control group, it was 242.1 mg/dl (> 240 mg/dL) in the upper category, but decreased to 230 mg/dl (200-239 mg/dl) in the upper category.

The statistical test results in Table 5 show that the mean difference in cholesterol before and after in the intervention group was 51 mg/dl with a standard deviation of 15.6 (p <0.05), Whereas in the control group the difference before and after averaged 11.4 mg/dL, standard deviation -0.2, with (p>0.05). Statistical test results, there is a significant effect of giving a combination of guava and avocado juice and nutrition counseling on reducing cholesterol at the Sukamerindu Health Center, Bengkulu City.

DISCUSSION

Characteristics of Respondents

Respondents age characteristic ranged from 45 to 59 years old. This age is the age group of adults and pre-elderly. When entering pre-elderly, it will be marked by the skin starting to relax, the hair starting to turn gray, starting to experience decreased hearing, vision, and emotional sensitivity. Pre-elderly people prefer all instant foods that contain lots of fat, causing a lack of frequency of vegetable consumption, which results in uncontrolled food and nutritional balance cannot be fulfilled, so they are more susceptible to degenerative diseases such as hypercholesterolemia.[10]

It is known that the characteristics of respondents based on gender are mostly women 75 percent. After women go through menopause, they have higher cholesterol levels than men. This is caused by a decrease in the hormone estrogen. *Low-Density Lipoprotein (LDL)* cholesterol become more permeable to plaque in blood vessel walls when oxidized. Estrogen's role as an antioxidant prevents the oxidation of LDL, thereby reducing its ability to enter plaque.[11]

Characteristics based on education are mostly highly educated. A person's ability and knowledge in implementing a healthy lifestyle can be influenced by the level of education. The higher the education, the better one's ability and knowledge in maintaining a healthy lifestyle.

Individual characteristics based on work include Civil servants, housewives and entrepreneurs. The highest average cholesterol levels were found in the PNS and housewives group, this might be caused by high activity and work demands that cause a person to become stressed. Stress can interfere with the way the body metabolizes fat which ends in soaring LDL cholesterol levels.[12] Body movements performed by skeletal muscles to generate energy can reduce risk factors for cardiovascular disease. Body movement can also increase HDL levels, reduce LDL and triglyceride levels, and reduce high blood pressure and increase insulin sensitivity.

Effects of Giving Guava and Avocado Juice and Dietary Advice on Cholesterol Levels

Cholesterol is one of the main components of cell membranes function in the survival and growth of cells in the body.[13] Cholesterol is formed in the liver in the form of cholesterol esters. In the intestine, the ester is hydrolyzed by pancreatic cholesterol esterase. The free cholesterol that is formed is absorbed into the intestinal mucosal cells and eventually enters the bloodstream. Cholesterol is absorbed in the intestine and in the form of cholesterol chylomicrons is carried to the liver. Cholesterol is carried by VLDL to form LDL through IDL. LDL will carry cholesterol to all peripheral tissues as needed. The remaining cholesterol will bind to HDL and be returned to the liver so that it does not accumulate in the tissues. Cholesterol in the liver is excreted into bile acids, some of which are excreted in the feces, through the hepatic portal vein some of the bile acids are absorbed by the intestine which is called the enterohepatic cycle.[14]

Statisticly the analysis results, the average cholesterol level of respondents in the intervention group decreased before and after administration of guava and avocado juice and nutritional counseling with a *median*

difference of 51 mg/dL, with p-value 0,005. Cholesterol levels in the control group before and after nutritional counseling showed no significant effect with a different mean value of 11.4 mg/dL, and p-value 0.415.

The results of statistical tests showed a p-value of 0.005 (p <0.05) in the intervention group, which means that there was a significant effect on the cholesterol levels of the respondents before and after consuming guava and avocado juice and nutritional counseling. This is in line with Djamaludin's study (2020) which was conducted on hypercholesterolemic patients with an age range of 45 to 65 years by giving 200 ml of guava juice for 7 consecutive days in the morning before breakfast which showed a decrease in cholesterol levels.[15] Giving guava and avocado juice as much as 300 ml for 7 consecutive days has an effect on cholesterol levels. One of these alternative foods can lower blood cholesterol levels in the long term. Red guava fruit is known to contain vitamin C and beta carotene so that it is efficacious as an antioxidant and increases endurance. In addition, red guava contains high fiber, namely pectin, around 5.60 g per 100 g. Pectin can slow gastric emptying and lower cholesterol, so you can limit your calorie intake. Pectin plays a role in increasing the excretion of cholesterol and bile acids. Fiber can also bind fat in the intestines. During digestion, fiber forms gelatin, then binds bile acids and cholesterol, and is finally excreted in the feces.[16] The content of phenolics and flavonoids in guava pulp may have an important role in inhibiting lipid peroxidation. In Kumari's study (2016) showed that supplementing guava fruit with its skin caused an increase in total cholesterol, triglycerides and LDL in serum. In the digestive tract, fiber acts as a prebiotic and is fermented by bacteria to produce propionate and butyrate which inhibit cholesterol synthesis.[10]

In reducing cholesterol levels, in addition to using guava fruit, researchers also use avocado fruit as an alternative functional food in lowering cholesterol levels. Avocados contain oil which is rich in monounsaturated fat of 71 percent, namely single oleic acid which is a strong antioxidant which is useful for reducing LDL cholesterol levels.[17] Avocado is one of the natural ingredients that can help increase HDL levels, lower total cholesterol levels, and also lower LDL levels. This condition is thought to be caused by the content of active ingredients in avocados such as omega-9 oleic acid, pantethine, niacin (vitamin B3), beta-testosterone, vitamin C, vitamin E, vitamin A, pantothenic acid, MUFA, folic acid, selenium, amino acid and fiber.[18]

Avocado flesh contains omega-9 oleic acid to maintain its function, namely in cell membranes as a signal transmitter and regulator to maintain membrane moisture so that it can maintain LDL receptor activity on cell membranes, so that it can accelerate the cholesterol absorption cycle. Furthermore, more circulating LDL cholesterol enters the liver cells and circulating LDL cholesterol decreases. Beta-sitosterol (a phytosterol derivative) found in avocado may lower blood cholesterol levels by inhibiting cholesterol absorption and increasing blood cholesterol excretion. Vitamin B3 (niacin) can reduce VLDL production, so that IDL and LDL levels decrease which will reduce total cholesterol levels. Vitamin C has the effect of helping hydroxylation reactions in the formation of bile acids, which can increase cholesterol excretion and lower blood total cholesterol levels.[18]

This research is in line with Purhadi's research (2019), which showed that there was an effect of giving avocado juice 2x/day with a dose of 50 grams/day of avocado flesh plus 140 ml of water for 7 days with (p-value <0.05) which means that avocado juice plays a role in lowering cholesterol levels.[19] However, there is the same study but has greater results as in the study of Nurman and Afifah (2019), by administering avocado juice with a dose of 250 grams of avocado and adding 80 grams of water given 1x a day in a row for 5 days, showing that there is an effect of giving avocado juice on cholesterol.[8]

The decrease in cholesterol levels in this study was also related to the existence of nutritional counseling. Implementation of nutritional counseling is carried out using leaflet media which is carried out 2 times a week, namely at the beginning of the examination and the end of the examination. The purpose of providing nutrition counseling is to improve the mindset of individuals and families in taking steps to overcome nutritional problems including changing eating patterns and solving problems related to nutrition towards healthy living habits.[20]

Based on the results of the study, prior to nutritional counseling, the respondents' eating patterns were unbalanced and they even consumed foods containing high cholesterol, such as fatty meat, junk food, egg yolks, coconut milk foods, fried foods, and low consumption of fiber (vegetables and fruit). This is because before the research was carried out most of the respondents had never done a total cholesterol level examination so they did not know that their total cholesterol was above normal/high.

Counseling is given in stages by means of lectures, discussions, or sharing among high cholesterol sufferers which involves more respondents, and is repeated and reviewed before proceeding to the next discussion so that respondents more quickly and easily capture or understand the knowledge provided.[21] The provision of leaflets as a guide can affect the success of counseling delivery, so that nutrition counseling does not only take place face to face but can be carried out independently by respondents.[22]

Fat Intake

The results of the 2x24 hour *recall* during the study revealed that the average fat intake of respondents in the intervention group was 32.50 grams lower than the daily RDA of fat, which was 60 grams and the average fat intake of respondents in the control group was 39.37 grams, which was higher lower than the AKG. Fat intake is one of the causes of rising cholesterol in the blood. Increased total cholesterol levels in the blood can be caused by increased consumption of saturated fat and high cholesterol in food.[13]

CONCLUSION

The results of statistical tests conducted to determine the effect of giving guava and avocado juice and nutritional counseling on reducing cholesterol levels showed that the average total cholesterol level in the intervention group before giving guava and avocado juice was 262.5 mg/dl in the high category (> 240 mg/dL) decreased to 211.5 mg/dL in the cutoff category (200 to 239 mg/dL) with a significant decrease of 51 mg/dL with p 0.005. From these results obtained p <0.05, which means Ha is accepted, so it can be concluded that there is a significant effect of giving guava and avocado juice and nutritional counseling on reducing cholesterol levels in pre-elderly hypercholesterolemia at the Sukamerindu Health Center, Bengkulu. It is strongly recommended that to add lifestyle intervention such as hope impact exercise or jogging in order to gain better result.

RECOMMENDATION

It is strongly recommended that to add lifestyle intervention such as hope impact exercise or jogging in order.

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