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EFFECTIVITY OF SUKAMOND PUDDING AS A HEALTHY SNACK FOR HYPERCHOLESTEROLEMIA PATIENTS

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ABSTRACT

Background: Hypercholesterolemia is a disorder of cholesterol metabolism caused by cholesterol levels in the blood exceeding normal limits. Sukamond Pudding is a pudding made from milk flour, rice bran, and almonds, which contain high fiber, vitamin C, and Vitamin E. This study aims to analyze the effectiveness of giving Sukamond pudding as a healthy snack in hypercholesterolemia sufferers.
Method: This type of research is quantitative with a quasi-experimental research design. This research was conducted from December 2022 to January 2023 at the OKU Sekarjaya Health Center. The research sample was selected by systematic random sampling with a total sample of 60 respondents.
Result: There was an effect of giving Sukamond as a healthy snack to patients with hypercholesterolemia (p=0.000).
Conclusion: The results of statistical tests showed that there was an effect of giving Sukamond as a healthy snack to people with hypercholesterolemia.

Keywords: Total Cholesterol Level, Hypercholesterolemia, Sukamond Pudding

INTRODUCTION

Hypercholesterolemia is a cholesterol metabolism disorder caused by cholesterol levels in the blood exceeding normal limits (Ministry of Health RI, 2022). Cardiovascular disease is usually a complication of hypercholesterolemia. Cholesterol can irritate and break down blood vessels (Sanlia et al., 2020). The formation of plaque on the arterial wall causes an inflammatory process caused by metabolic disorders, increased LDL and lipoprotein levels, and decreased HDL levels (Nurhidajah et al., 2019).

Hypercholesterolemia is a major cardiovascular risk factor that increases the incidence of atherosclerotic disease in adults (Félix-Redondo et al., 2013)). Factors causing atherosclerosis and atherosclerotic cardiovascular disease due to increased serum triglyceride levels (Ohmura, 2022). Each individual has a variation of risk of coronary heart disease. Part of this variation can be explained by risk factors (Simonetto et al., 2022). Cholesterol includes steroid molecules such as bile salts, steroid hormones, and vitamins. Bile salts are synthesised in the liver before becoming a very effective molecule in dissolving fat (Benito-Vicente et al., 2018). Based on research conducted by (Daum Aner et al, 2019), familial hypercholesterolemia causes an increase in LDL-C levels and a decrease in HDL-C.

Based on data from the World Health Organization (WHO) in 2018, it was recorded that more than 160 million people worldwide have hypercholesterolemia with total cholesterol levels > 200 mg/dl, which is

included in the rather high category. In the next 5 years, developing countries such as Indonesia will experience an increase of 137%, while in developed countries, it will only increase by 48%. According to the 2018 Riskesdas, the prevalence of heart disease in Indonesia is 1.5%. The prevalence of heart disease in South Sumatra is 1.2%. The prevalence of heart disease in Ogan Komering Ulu Regency is 1.1%. The Sekarjaya Health Center is one of the health centres in OKU Regency, and in 2021, the prevalence of hypercholesterolemia is 2.8%.

In addition to using pharmacological therapy prescribed by doctors, non-pharmacological treatment of hypercholesterolemia that is appropriate to the patient's disease conditions must be carried out (Cabral & Klein, 2017). Non-pharmacological treatment reduces total cholesterol levels in the blood by consuming foods that contain fibre, vitamin C and E nutrients. These can lower cholesterol levels. Food that can be given to hypercholesterolemia sufferers to reduce total cholesterol levels is Sukamond pudding. The aim of this research is to determine the effect of giving Sukamond pudding (flour milk, rice bran and almonds) as a snack for hypercholesterolemia patients.

METHODS

Methods This study uses a quantitative method with a quasi-experimental research design.

This study included two groups: the treatment group and the control group (as Control). The treatment group was the group that was given Sukamond pudding and received cholesterol-lowering drugs, while the control group was the group that only received cholesterol-lowering drugs. The research was conducted at the Sekarjaya Health Center, Ogan Komering Ulu District, South Sumatra Province. The research was carried out in December 2022 - January 202 3. After being determined using the formula, the number of samples used was 60 respondents, with the division of each treatment group consisting of 30 respondents and a control group of 30 respondents. Sampling used a systematic random sampling method.

The sample in this study had inclusion criteria, namely aged ≥ 30 years, total cholesterol levels above ≥ 200 mg/dl, hypercholesterolemic outpatients with mild complications such as hypertension, taking cholesterol-lowering drugs prescribed by doctors, and willing to be respondents. The exclusion criteria were patients with hypercholesterolemia hospitalised with complications from diabetes mellitus, kidney, and liver. As well as residing outside the working area of the Sekarjaya OKU Health Center. In this study, the treatment group was given Sukamond Pudding for 7 consecutive days twice a day, namely a morning snack at 10.00 and an afternoon snack at 16.00. Each serving of 225 g of Sukamond Pudding can contribute 10-20% of daily nutritional needs. The nutritional value of 1 portion of Sukamond Pudding is energy 251 kcal, protein 9.27 g, fat 8.7 g, carbohydrates 33.7 g, dietary fibre 5.83 g, vitamin C 18.18 mg, vitamin E 6.7 mg.

Sukamond Pudding is a pudding made from prosteo plus milk flour, rice bran, and almonds, which contain the right nutrients that may reduce total cholesterol levels. (Soliman, 2019), giving rice bran can significantly reduce LDL cholesterol in patients with hypercholesterolemia because it contains good nutrition and high fibre, potentially reducing total cholesterol levels (Irma et al, 2018). One hundred grams of bran contains 423.19 kcal of energy, 16.61 g of protein, 33.24 g of KH, 24.15 g of total fibre, and 438 mg of calcium (Aparecida et al., 2012). The milk used is Prosteo Plus powdered milk. Prosteo Plus is a low-fat and high-protein cholesterol-free milk powder useful for building and repairing body tissues.

It is high in dietary fibre, which can help lower blood cholesterol levels if accompanied by a diet low in saturated fat and cholesterol. In research (Kalita et al., 2018), almonds can reduce LDL-C, a risk factor for coronary heart disease. Studies have also looked at the effect of almonds on HDL-C, and it has been found that consumption of almonds has helped maintain and even increase HDL-C levels.

Sukamond Pudding is a pudding made from prosteo, milk flour, rice bran, and almonds. Prosteo plus milk is low-fat, cholesterol-free, high in dietary fibre and vitamin C, making it very suitable for helping reduce cholesterol in the blood. Rice bran is a food ingredient high in dietary fibre, and almonds contain unsaturated fats and are high in vitamin E. Apart from these three ingredients, agar-agar flour, water, and sugar are added, then cooked until boiling and placed in a mould.

This study used univariate, bivariate, and multivariate analysis. Research Ethics Number: 596 / KEPK / Adm2 /VIII/ 2022.

RESULTS AND DISCUSSION

Results

1. Univariate Analysis

Table 1. Characteristics of Respondents

Characteristics of Respondents	Treatment		Control	
	n	%	n	%
Gender				
Man	16	53,3	17	56,7
Woman	14	46,7	13	43,3
Total	**30**	**100**	**30**	**100**
Age				
30- 39	2	6, 7	7	23,3
40-49	6	20.0	9	30
50 - 59	10	33,3	7	23,3
60-69	12	40	7	23,3
Total	**30**	**100**	**30**	**100**
Nutritional status				
Thin	0	0	0	0
Normal	10	33,3	4	13,3
Overweight	14	46,7	10	33,3
Obesity	6	20	16	53,3
Total	**30**	**100**	**30**	**100**

Table 2. Average Total Cholesterol Before Intervention

Group	Number of Samples	Highest Cholesterol	Lowest Cholesterol	Average	Std. Deviation
Treatment	30	329	242	275, 67	23,176
Control	30	337	243	251, 27	21,826

Table 3. Average Total Cholesterol After Intervention

Group	Number of Samples	Highest Cholesterol	Lowest Cholesterol	Average	Std. Deviation
Treatment	30	280	173	223, 27	24,100
Control	30	315	183	254, 43	28,922

Table 4. Nutritional Intake

Nutrients	Treatment		Control	
	n	%	n	%
Energy				
More	5	16,7	12	40
Good	25	83.3	18	60
TOTAL	**30**	**100**	**30**	**100**
Protein				
More	6	20.0	11	36,7
Good	24	80.0	19	63,3
TOTAL	**30**	**100**	**30**	**100**
Fat				
More	9	30.0	11	36,7
Good	21	70.0	19	63,3
TOTAL	**30**	**100**	**30**	**100**
Carbohydrate				
More	10	33,3	16	53,3
Good	20	66,7	14	46,7
TOTAL	**30**	**100**	**30**	**100**
Fiber				
More	0	0	0	0
Good	24	80.0	17	56,7
Not enough	6	20,0	13	43,3
TOTAL	**30**	**100**	**30**	**100**
Vitamin C				
More	0	0	0	0
Good	26	86.7	19	63,3
Not enough	4	13,3	11	36,7
TOTAL	**30**	**100**	**30**	**100**
Nutritional status				
More	0	0	0	0
Good	25	83.3	17	56,7
Not enough	5	16,7	13	43,3
TOTAL	**30**	**100**	**30**	**100**

2. Bivariate Analysis

Tabel 5. Differences in Average Total Cholesterol Before and After Intervention

Group	Initial means	Final means	p-values
Treatment	275, 67	223,26	0.0 02
Control	277,10	254, 43	0.018

Tabel 6. The Effect of Giving Sukamond Pudding on Reducing Total Cholesterol

Group	Average Difference	t	p-value
Treatment	5 2.41	4, 676	0.000
Control	22.67		

3. Multivariate Analysis

Tabel 7. Candidate Selection Results based on sequence

Subvariable	Betas	Sig
Vitamin C	2.900	0.004
Fiber	4 ,211	0.066

The results of the analysis above can be concluded that from all the independent variables (fiber, vitamin C, and vitamin E) turned out to be vitamins C has a significant value, namely p-value < 0.005, which means Vitamin C has the greatest influence on reducing levels total cholesterol. The beta value of Vitamin C has a positive relationship pattern meaning the more vitamin C consumed, the more decreased total cholesterol levels.

Discussion

1. Age

Based on the results of this study, it was conducted on 60 respondents who were the research sample. The majority of hypercholesterolemic sufferers in the treatment and control groups were aged 60-69 years, namely 19 people (31.67%) in the treatment and control groups. Total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglyceride (TG) levels must be checked regularly so that you know if you have coronary artery disease (Caselli et al., 2021). Low values of lipoprotein cholesterol, apolipoprotein A-I and monocytes/high-density lipoprotein can interpret the severity of coronary heart disease (Li et al., 2020). The results of this study are in line with research by (Félix-Redondo et al., 2013). Hypercholesterolemia is a risk factor that increases the incidence of atherosclerotic disease in adults and the elderly.

2. Gender

In this study was found that in both the treatment group and the control group, the majority of respondents were male, namely 16 people (54.3%) in the treatment group and 17 people (60%) in the control group. This is in line with research (Nikolaos Mavritsakis et al., 2019); 54 males and 118 females were diagnosed with obesity. 45 out of 54 males had very low HDL. In contrast to females, only 35 out of 118 women had very low HDL.

3. Nutritional Status

Based on the results of this study, the majority of respondents had overweight nutritional status, namely as many as 14 people (46.7 %). In the control group, most of them had obese nutritional status, i.e 16 people (53,3%). This is in line with research (Rhee et al., 2019). Individuals who are obese or overweight find that total cholesterol, LDL-C, and triglyceride concentrations decrease with weight loss. Therefore, energy intake must be consumed to create an ideal body weight. Research conducted by (Satoh et al., 2021) showed that Individuals with high total cholesterol levels cause an increase in the LTR of CHD mortality in hypertensive individuals.

4. Nutrition Intake

a. Energy

Most of the respondents in this study had good energy intake, as many as 25 people (83.3%) in the treatment group and good energy intake in the control group of 18 people (6 0%). (Sugini, 2019) the data analysis results were that there was a relationship between energy intake and total cholesterol levels (p=0.016, r=0.434). High energy intake also results in fat accumulation, especially triglycerides. It can also increase VLDL and IDL in the blood, which will have an impact on increasing total cholesterol.

b. Proteins

Some of the respondents in the study, both the treatment group and the control group, had sufficient protein intake according to their needs. Research results (Fernandez & Murillo, 2022) show that the increase in LDL in adults following intake of 640 mg/day of cholesterol (3 eggs) resulted in higher LDL concentrations compared to 0 mg of additional cholesterol in adults. However, this is different from the results of a study (Pasiakos et al., 2015), which showed that the cardiometabolic benefits of a high-protein

diet in free-living adults were limited to an increase in HDL cholesterol.

c. Fat

Most respondents in this study had a greater fat intake than needed. However, still, some people still consume excess fat. Individuals with hypercholesterolemia are recommended to consume dietary cholesterol up to < 200 mg/day to reduce LDL cholesterol and non-high-density lipoprotein cholesterol concentrations (Carson et al., 2020). This is in line with research (Lordan et al., 2018). Another study fed 40 g/day of butter or cooked cheddar cheese to 19 participants with hypercholesterolemia for four weeks in a randomised cross-sectional trial. They observed that total cholesterol and LDL cholesterol increased significantly in the butter group (p-value < 0.05).

d. Carbohydrate

Most of the respondents in this study had adequate carbohydrate intake for their needs. Consuming daily food should not be excessive, especially carbohydrates. Excessive carbohydrate intake, especially simple sugar intake, can increase blood triglyceride levels. It is recommended that consumption of total carbohydrates be limited to 65% of daily energy intake (Rhee et al., 2019). The results of (Utami et al., 2017) showed that carbohydrate intake is related to total cholesterol levels in coronary heart disease patients at Dr Kariadi General Hospital, Semarang. The biggest risk factor for CAD is abnormal blood lipid metabolism. The risk is also greater with high total cholesterol concentration (Liang et al., 2022).

e. Fiber

Most respondents in this study had enough fibre intake than needed. Regular consumption of soluble fibre, such as beta-glucans from wheat or barley, has been shown to lower blood levels of LDL cholesterol, a risk factor for cardiovascular disease. Insoluble fibre that does not dissolve in water – inert to digestive enzymes in the upper digestive tract. Most diets combine soluble and insoluble fibre, with 75 per cent coming from insoluble fibre and 25 per cent from soluble fibre (Chibuzo et al., 2021). This study is in accordance with research (Soliman, 2019) showing that there was a significant decrease in LDL cholesterol in the intervention group that consumed 50 mg of rice bran extract compared to the placebo group (from 163 ± 25.3 mg/dL to 135.9 ± 26.8 mg /dL).

f. Vitamin E

Most of the respondents in this study had sufficient intake of vitamin E. Hal ini sejalan dengan studi intervensi dari (Liao et al., 2022) bahwa setelah enam minggu 30 orang dewasa menerima dosis farmakologis vitamin E (73,5 mg/hari), Aktivitas enzim antioksidan glutathione peroksidase (GPx) dalam plasma meningkat, dan konsentrasi kolesterol total menurun pada waktu yang sama pada kedua kelompok. In research (Garg & Lee, 2022), Vitamin E is a very important antioxidant because it can inhibit oxidation so that LDL is not able to penetrate the artery walls. Vitamin E can neutralise peroxidase intermediates (free radicals) and prevent damage to vital molecules by converting radicals into hydroperoxide.

5. The Effect of Giving Sukamond Pudding on Changes in Total Cholesterol Levels

An independent t-statistic test that has been carried out shows that there is a significant effect of giving Sukamond pudding on reducing total cholesterol levels. Bran is a by-product of the rice milling process, which can be used as an additional ingredient in cake making because it has good nutritional content and high fibre, so it has the potential to reduce total cholesterol levels (Aparecida et al., 2012). Vitamin C in Prosteo plus milk can also lower cholesterol levels. Vitamin C (ascorbic acid) as an antioxidant affects the lipid profile. Almonds, which are also one of the ingredients for making pudding, also have vitamin E, which has a positive effect on total cholesterol levels.

This is also in line with the results of (Muzakar et al., 2010), the results of the chi-square statistical test for vitamins B3, vitamin

C, vitamin E, and fibre obtained p <0.05, which means that there is an effect of vitamin C on reducing cholesterol levels. Multivariate analysis was tested on the treatment group using total cholesterol data after intervention. Multivariate analysis showed that the nutrient that had the most effect on reducing total cholesterol levels was vitamin C, where the statistical result was p-value = 0.0 04. Nevertheless, for the nutrients vitamin C, fibre, and vitamin E are equally significant, using Sukamond pudding to lower total cholesterol levels still needs to be controlled.

CONCLUSION

Most of the respondents are in the age category 40-49 and 60-69 years. The sex of the respondents is mostly male. Nutritional status of respondents Most of the respondents in the treatment and control groups had nutritional status of overweight. The average total cholesterol after treatment decreased significantly.

Dependent T-test shows total cholesterol levels before and after had differences in the treatment group. Independent T-test showed that there was an effect of giving sukamond pudding on total cholesterol levels in hypercholesterolemic patients. The multivariate analysis showed that the most influential nutrient for reducing total cholesterol levels was contained in the pudding (vitamin C).

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CONFLICT OF INTEREST

All authors declare no conflict of interest.

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