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Effects of Sago Consumption Pattern on LDL and HDL in Women 35-55 Years North Luwu District

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ABSTRACT

Background: Lipid abnormality is one of the risk factors for coronary heart disease. there is one way to lower blood lipid levels by consuming high fiber (> 25 g / day) which can decrease lipid especially LDL and sago also have high enough food fiber (3,69-5,96%).
Objective: The aim of this research is to know the effect of consuming sago to LDL and HDL levels to women aged 35-55 years in Luwu Utara District. The type of research is observational by using cross sectional method.
Method: Sampling was done by using cluster random sampling technique by classifying the sample into two groups, such as the group that often consume sago and the group that rarely consume sago with each sample of 42 people group so that the total sample in this research is 84 people. The data were analyzed using Whitney Man Test.
Results: The results showed that there was an average difference of LDL levels in both groups (p = 0.000). However, there was no difference in mean HDL levels in both groups (p = 0.055). There were differences in fat, carbohydrate, vitamin C, zinc and copper intake between the two groups, each having a p value of 0.031; 0.019; 0.009; 0,000; 0.038. In the group who often eat sago has a fat, zinc and copper intake is lower than the group who rarely eat sago, and have a carbohydrate intake, vitamin C is higher than the group rarely consume sago.
Conclusion: It can be concluded that the average LDL levels in the group who often consume sago is lower than in the group that rarely consume sago, thus sago consumption patterns can affect the levels of LDL in the blood.

Key words: Sago, LDL, HDL.

INTRODUCTION

Coronary Heart Disease (CHD) is one of the non-infectious diseases that have become the world's spotlight. According to world statistics, there are 9.4 million deaths annually caused by cardiovascular disease and 45% of those deaths are caused by coronary heart disease. [1] In the United States, it is reported that every minute there is one person who dies of CHD. In Indonesia also reported the existence of the same or almost the same. [2]

One of the risk factors for coronary heart disease is the abnormality of blood lipid levels. A series of studies indicate that high LDL levels are thought to be the main cause of coronary heart disease. In a population of>15 years has found that total abnormal cholesterol is 35.9 percent, HDL is low 22.9 percent, LDL is not optimal with a combination category near optimal-borderline high 60.3 percent and high category-very high 15.9 percent, abnormal triglycerides with a high borderline category of 13.0 percent and high-very high category of 11.9 percent, as well as an abnormal serum creatinine of 6.0 percent. [3]

Research conducted by Yuliani et al (2014) states that there is a significant relationship between dyslipidemia against coronary heart disease with p value = 0.000. [4] In line with research conducted by Bano et al (2016) looking at the relationship of lipid profile and coronary heart disease in men indicated that high levels of cholesterol, LDL and triglycerides and low HDL are strong indicators of coronary heart disease events. [5]

Diet has been a particular concern in the prevention of cardiovascular and cardiovascular disease, especially coronary heart disease. Unhealthy eating patterns can increase blood cholesterol levels that will accumulate in the inner walls of the blood vessels that can cause atherosclerosis. [6] One way to lower blood lipid levels by consuming high fiber. A diet high in dietary fiber (>25g/day) was associated with a decrease in the incidence of CHD. Increased soluble fiber intake of at least 5 to 10 g/day can reduce LDL cholesterol by 5 percent. [7] A study conducted by McRae et al (2017) concluded that a person consuming the highest levels of dietary fiber can significantly reduce the incidence and death of cardiovascular disease. Mechanically, this beneficial effect due to dietary fiber can reduce total cholesterol and LDL concentrations between 9.3 to 14.7 mg/dL and 10.8 to 13.5 mg/dL. [8]

Sago is one of the staple foods that can reduce LDL levels in the blood because it contains high dietary fiber (3,69-5,96%), carbohydrate (84,7%), low glycemic index (28), and contains resistant starch, polysaccharides instead of starch, and short chain carbohydrates that are very useful for health. [9]

Most of the people in Luwu have consumed sago because North Luwu Regency is a sago-producing center. The high percentage of people who frequently consume sago is due to the fact society considers sago is the second staple food after rice. [10] Luwu and Luwu Utara Districts are the biggest sago producers in South Sulawesi. The potential of sago land in Luwu Regency is 1,462 ha (35.6%) and in Luwu Utara with 1,590 ha (38, 8%). [11]

Based on the description, one form of prevention for CHD risk is to maintain LDL and HDL levels under normal conditions, one of them by eating sago. So researchers would like to see the influence of sago consumption which is one of staple food in Luwu Utara District against LDL and HDL levels in women aged 35-55 years of North Luwu District.

MATERIALS AND METHODS

Method of collecting data

The research was conducted in three locations in Luwu Utara District, Buangin Village, Masamba Village and Kaluku Village from May to August 2017. The research type was observational with cross sectional design. The population in this study were all women aged 35-55 years who were in the three study sites. The sample in this study was chosen based on the inclusion criteria and divided into 2 groups that often consume sago and the group that rarely consume sagi with each 42 people group so that the total sample in this research is 84 people. Data collection consists of primary data and secondary data. Primary data of abdominal circumference and blood pressure were obtained through measurement of abdominal circumference and blood pressure performed by local health workers. Physical activity data, 24 hour recall and Semi Quantitative Food Frequency were obtained through direct interviews to respondents. Secondary data were obtained from the District Health Office of Luwu Utara Regency.

Data analysis

The data of food intake was processed by using Nutrisurvey software, while the data of LDL, HDL and physical activity were processed using SPSS version 20. Univariate analysis describes the characteristics of all variables in the form of frequency distribution tables, bivariate analysis using independent T-Test if the samples were distributed normal and Mann Whitney test if the sample is not normally distributed. Presentation of data in table form and accompanied by narration.

RESULT

Characteristics of Respondents

Distribution of general characteristics of respondents based on groups that often consume sago and a group that rarely consume sago can be seen in Table 1.

Table 1: Characteristic of Respondents

Characteristic of Respondents	Groups that often consume Sago		Groups that rarely consume Sago	
	n	%	n	%
The Research of Location				
Buangin	19	45.2	8	19
Masamba	7	16.7	9	21.4
Kaluku	15	38.1	25	59.5
Age				
35-45	28	66.7	19	45.2
46-55	14	33.3	23	54.8
Education				
No Education	0	0	2	4.8
Elementary School	9	21.4	18	42.9
Junior High School	18	42.9	7	16.7
Senior High School	13	31	13	31
College	2	4.8	2	4.8
Profession				
Tocologist	1	2.4	0	0
Teacher	0	0	1	2.4
Housewife	37	88.1	31	73.8
Salesman	4	9.5	10	23.8
Physical Activity				
Mild	33	78.6	27	64.3
Moderate	9	21.4	15	35.7

The location of the study group that consumed the most sago in Buangin village was 45.2% while for the rarely consume the most sago in Kaluku village was 59.5%. Age distribution in the group often consumed the most sago in age group 35-45 years amounted to 66.7% and the group rarely consume sago in the age group 46-55 years that is equal to 54.8%. The level of education of respondents in the group often consumed the most sago at the SMP level of 42.9% while the group rarely consume sago at the elementary level of 42.9%. The highest number of IRT respondents, 81.1% in the group, often consumed sago and 73.8% in the group seldom ate sago. Physical activity of respondents in both groups was mostly in light activity that was 78.6% in the group often consumed sago and 64.3% in the rarely sago group.

Comparison of the Average Round of Stomach, Systolic Blood Pressure and Diastolic Blood Pressure

The results of statistical analysis of abdominal circumference, systolic blood pressure and diastolic blood pressure on the group often consume sago and the group rarely consume sago can be seen in Table 2.

Table 2: Comparison of the Average Round of Stomach, Systolic Blood Pressure and Diastolic Blood Pressure

Variable	Groups who often consumes Sago			Groups who rarely consumes Sago			p value
	Mean±SD	95 % CI		Mean±SD	95% CI		
		Lower	Upper		Lower	Upper	
Abdominal Circumference	81,68±10,47	78,42	84,94	85±11,04	81,56	88,44	0,161
Systolic Blood Pressure	123,57±15,58	118,71	128,43	124,05±16,97	118,76	129,34	0,956
Diastolic Blood Pressure	87,62±9,83	84,56	90,68	86,43±10,78	83,07	89,79	0,573

The mean value of abdominal circumference in the group often consumed sago was 81.68 cm and the mean abdominal circumferences in the group rarely consumed sago was 85 cm, but the difference was not statistically significant where p = 0.161. The mean systolic blood pressure in the group often consumed sago was 123.57 mmHg, and the mean systolic blood pressure in the group rarely consumed sago was 124.05 mmHg, with p = 0.956, which means that is not a difference in mean blood pressure systolic on both groups. Similarly, diastolic blood pressure with a value of p = 0.573 that there is no difference between the two groups. The average diastolic blood pressure in the group often consumed sago was 87.62 mmHg, whereas the mean systolic blood pressure level of the group rarely consumed sago was 86.43 mmHg.

Comparison in Average LDL and HDL Levels

The results of statistical analysis in the average ratio of HDL and LDL levels in the group often consume sago and the group rarely consume sago can be seen in Table 3.

The average LDL level in the group often consumed sago is 77,48 mg / dL whereas in the group rarely consume sago that is 102,83 mg/dL with p value = 0,000 which is difference of LDL level between group often consume sago and group rarely consume sago. Otherwise, the mean HDL levels showed that there was no significant

difference in the group often consuming sago and the group rarely ate sago with p = 0.055. On average, HDL levels in the group often consumed sago (47.57 mg/dL) and the mean HDL levels in the group rarely consumed sago (52.14 mg/dL).

Table 3: Comparison in Average LDL and HDL Levels

Lipid Profile	Groups who often consumes Sago			Groups who rarely consumes Sago			p value
	Mean±SD	95 % CI		Mean±SD	95% CI		
		Lower	Upper		Lower	Upper	
LDL	77,48 ± 20,95	70,94	84	102.83 ± 30,34	93,38	112,29	0,000
HDL	47,57 ± 9,54	44,59	50,55	52,14 ± 11,88	48,44	55,85	0,055

An Average Comparison of Intake based on 24 Hour Food Recall

Measurement results on food intake of respondents based on 24-hour Food Recall that have been analyzed with nutrisurvey in the group often consume sago and the group rarely consume sago can be seen in Table 4.

Table 4: An Average Comparison of Intake based on 24 Hour Food Recall

Intake	Groups who often consumes Sago	Groups who rarely consumes Sago	p value
	Mean±SD	Mean±SD	
Energy	1882,97 ± 117,65	1863,79 ± 125,69	0,491
Protein	52,85 ± 9,43	58,06 ± 14,30	0,052
Fat	35,25 ± 11,69	41,82 ± 15,42	0,031
Carbohydrate	335,07 ± 24,24	310,44 ± 43,39	0,019
Fiber	8,18 ± 4,84	7,94 ± 3,26	0,943
Vitamin A	528,43±337,22	519,23±619,73	0,125
Vitamin E	3,12±1,28	2,75±1,63	0,124
Vitamin C	27,71±14,88	21,05±21,72	0,009
Vitamin B_3	9,34±3,02	9,86±3,03	0,289
Calsium	223,73±134,33	289,44±409,94	0,050
Magnesium	241,43±44,12	263,28±63,14	0,085
Zink	5,30±1,28	6,71±1,58	0,000
Copper	0,74±0,18	0,81±0,18	0,038

The comparison of intake for both groups showed that there was no difference in the average intake in the intake of energy, protein, fiber, vitamin A, vitamin E, vitamin B3, calcium and magnesium in the group often consumed sago or group rarely consume sago with p value p = 0.491; p = 0.052; p = 0.943; p = 0.125; p = 0,124; p = 0,289; p = 0.050 and p = 0.085. For fat intake, carbohydrate, vitamin C, zinc and copper showed that there was a difference of intake in both groups with p = 0,031, p = 0,019, p = 0,009, p = 0,000 and p = 0,038. In the group often consume sago an average energy intake of 1882.97 kcal, 52.85 g protein, 32.25 g fat, 335.07 g of carbohydrates, fiber 8.18 g, vitamin A 528.43 mcg, vitamin E 3,12 mg, B3 9.34 mg, calcium 223,73 mg, magnesium 241,43 mg, zinc 5,30 mg, and copper 0,74 mcg. While in the group rarely consume sago an average energy intake of 1863.79 kcal, 58.06 g protein, 41.82 g fat, carbohydrate 310.33 g, fiber 7.94 g, vitamin A 519, 23 mcg, vitamin E 2.75 mg, vitamin C 21.05 mg, B3 2.61 mg, calcium 289.44 mg, magnesium 263.28 mg, zinc 6.71 mg and 0.81 mcg of copper.

The Relation in Physical Activity to LDL and HDL

The results of analysis in the relationship of physical activity with HDL and LDL levels in the group often consume sago and the group rarely consume sago can be seen in Table 5.

Table 5: The Relation in Physical Activity to LDL and HDL

Groups	Physical Activity	n (%)	HDL		LDL	
			Mean±SD	p value	Mean±SD	p value
Groups who often consumes Sago	Mild	33 (78,6)	48,73±9,97	0.135	80,03±21,91	0.132
	Moderate	9 (21,4)	43,33±6,56		68,11±14,23	
Groups who rarely consumes Sago	Mild	27 (64,3)	53,73±12,34	0.108	99,69±28,02	0.203
	Moderate	15 (35,7)	46,33±8,12		114,33±37,23	

The relationship between physical activity with LDL/HDL levels for both groups showed that there was no correlation between physical activity to LDL and physical activity to HDL either in group often consumed sago or group seldom consume sago with value p = 0,132 in group often consuming sago while in the group seldom consume sago has value p = 0,203.

DISCUSSION

The mean analysis of LDL levels in the group often consumed sago and the rarely consumed sago group showed that there was a statistically significant difference (p = 0,000) with the mean LDL level in the group often consuming sago of 77.48 mg/dL whereas in the group rarely consume sago that is 102,83 mg/dL. In contrast, the results of the analysis for the mean HDL levels in both groups showed that there was no statistically significant difference in HDL levels between the two groups (p = 0.055). Mean HDL levels in the group often consumed sago is 47.57 mg/dL whereas in the group rarely consume sago is 52.14 mg/dL. According to the research conducted showed that LDL levels in the group often consume sago much better than the group rarely consume sago average HDL levels in both groups including the normal category. A study that has been done by Huningkor in 2015 that the influence of traditional Maluku food (Sagu) to CHD shows that there is a difference in the average LDL levels in the group that consumed sago (Taniwel Village) with the group not consumed sago (Ambon city) p = 0,000 and there was an average difference in HDL levels in both groups with p = 0.000. [12]

In this study, the ratio of LDL / HDL in the group rarely consume sago is higher than the ratio of LDL / HDL in the group who often consume sago is 1.97 mg/dL for the group rarely consume sago and 1.63 mg / dL for the group often consume sago, although the ratio of LDL / HDL in both groups was not included at risk for coronary heart disease but still needs to be considered both in terms of health behavior and diet so as to prevent the occurrence of coronary heart disease in the future.

The ratio of LDL to HDL (LDL/HDL) illustrates that the profile of LDL cholesterol and HDL in the blood. The LDL/HDL ratio that shows abnormalities in LDL or HDL fraction levels can be either elevated LDL or decreased HDL levels. A study conducted by Chen et al (2016) who looked at the LDL/HDL ratio as one of the risk factors for cardiovascular disease among adults in Xianjiang China who stated that the value of the LDL/HDL ratio that can be used as a marker for detecting cardiovascular risk factors is 2 , 5 mg/dL. [13]

There is one way that can control blood lipid levels by consuming foods high in fiber. Sago is a local staple food that has high fiber content. Sago has nutritional value that is not inferior to other food sources such as rice, corn, cassava, and potatoes. Sago flour and its dairy products can be classified as functional foods because they have a high carbohydrate content (84.7%) and food fiber (3,69-5,96%), a low glycemic index (28), and contain resistant starch, polysaccharides not starch, and short chain carbohydrates that are very useful for health. [9]

Fiber has an important role to reduce blood cholesterol levels. Therefore, people who consume fiber at least 28 g per day can reduce cholesterol levels up to 15-19 percent. Epidemiological studies that examine fiber as a whole states that there is a relationship between fiber intake with total cholesterol levels because the fiber mechanism has the property of lowering blood cholesterol. Several studies have shown that soluble fiber lowers LDL levels without lowering HDL cholesterol levels. [14]

Another study conducted by Aprionika in 2016 that saw the association of fiber and vitamin C intake with HDL and LDL levels in hospitalized CHD patients at RSUD DR Moewardi Surakarta stated that there was no association between fiber

intake with LDL and HDL levels in CHD patients p = 0.937) and (p = 0.252) . [15]

This study looked at the average ratio of abdominal circumference, systolic blood pressure and diastolic blood pressure in both groups indicating that there was no difference in both groups. But the average abdominal circumference in the group that often consume sago better than the average abdominal circumference in the group that rarely consume sago. Meanwhile, a study conducted by Lannywati et al. in 2016 states that the prevalence of CHD is higher in the population with central obesity, based on data of abdominal circumference that belongs to the category of central obesity risk 1.45 times compared to non-obese to CHD. [16]

There was no difference in mean systolic and diastolic blood pressure in both groups because the samples used in this study were samples with normal blood pressure or borderline, so as to minimize the occurrence of bias in the study. Research conducted by Hussain, et al in 2016 states that hypertension is a risk factor for cardiovascular disease from 20% -25% is an incidence of coronary heart disease, 36%-42% incidence of stroke in both female and male sex, whereas one thirds of the incidence of CHD and half of the incidence of stroke at a young age or old age were due to smoking habits (25% CHD and 17% stroke). [17]

Analysis in food intake is done by calculating the amount of intake based on Nutritional Numbers (AKG). AKG determination is based on the calculation of AKG 2013 by considering its age group. The 2013 GPA grades for the age group of 35-55 years are energy (1900-2150), carbohydrates (285-323), protein (57), fat (53-60) and fiber (28-30), vitamin A (500), vitamin E (15), vitamin C (75), B3 (10-12), calcium (1000), magnesium (320), zinc (10) and copper (0.72). The determination of the percentage of AKG will be calculated by the formula that the amount of intake (gr) divided by the number of needs (based on AKG) then multiplied by 100 and the results are expressed in percent form. Results from percentages are categorized less if the percentage of intake is <80%, enough (80-100%) and more if> 100%.

In this study, there was a comparison of intake in both groups showing that there was no difference in the average intake of energy intake, protein, fiber, vitamin A, vitamin E, vitamin B3, calcium, and magnesium in the group often consumed sago or group rarely consume sago with p =>0,05. As for the intake of fat, carbohydrate, vitamin C, zinc and copper showed that there are differences in the average intake of both groups with the value p = <0.05. Although there are differences in fat intake, vitamin C, zinc and copper between the two groups but some are not in accordance with the recommended AKG 2013, while for carbohydrate intake is above 80% of AKG.

The high consumption of carbohydrates can lead to obesity which is one of the risk factors for coronary heart disease. A study conducted by Senduk et al in 2016 who looked at the lipid profile in obese adolescents in Bitung city showed that of the total sample of obese adolescents, 62% of the samples had HDL levels below normal and 82% of the samples had LDL levels above normal. [18] A study conducted by Ercho in 2014 that saw the association of obesity with levels of LDL and HDL against preclinical students at the Faculty of Medicine, University of Lampung showed that the average HDL yield of 38.26mg / dL and LDL of 153.83 mg / dL and concluded that there is a relationship means between obesity with HDL and LDL levels with p value <0.005. [19]

High consumption of carbohydrates can increase triglyceride levels and lower HDL levels. High triglyceride levels and low HDL levels can affect atherosclerosis and can also affect coronary heart disease. The increased level of triglycerides in the blood is one of the risk factors of coronary heart disease. Hypertriglyceridemia can lead to an increase in LDL cholesterol and a decrease in HDL cholesterol. Other studies

have shown that direct triglycerides may also act as independent risk factors, especially in men and women over the age of 50. [20]

A study conducted by Utami in 2016 that the effect of purple sweet potato capsule in HDL and LDL levels of central obesity teacher in SMPN Makassar City has shown that in the treatment group there was an increase in HDL 4, 12 mg / dl (10.9%) and statistically it shows that there is a difference between before and after intervention p = 0.00. There was a decrease of 24 mg / dl (13.6%) in LDL level and also statistically showed that there was difference before and after intervention p = 0,00 so it was concluded that the mean of HDL level had increased while in LDL decreased. Purple sweet potato is one type of antioxidant that contains vitamin C, vitamin A, beta-carotene, and antsianin. [21] Antioxidants are needed to prevent oxidative stress. Oxidative stress is a condition of imbalance between the amounts of free radicals present with the amount of antioxidants in the body. Free radicals are compounds containing one or more unpaired electrons in their orbital, so they are highly reactive and capable of oxidizing surrounding molecules (lipids, proteins, DNA, and carbohydrates). Antioxidants are so easily oxidized that free radicals will oxidize antioxidants and protect other molecules in the cell from oxidation damage by free radicals or reactive oxygen. When LDL is oxidized, Hydroxymethylglutaryl coenzyme A reductase will be activated to increase LDL levels. [22]

In this research, the relationship between physical activity to LDL level and the result obtained that there is no relationship both. This is because most respondents in this study have light physical activity. Physical activity that only sits continuously in work (sedentary) and lack of movement can increase the risk of CHD. Regular activity will increase the activity of lipoprotein lipase (LPL) enzyme and decrease the activity of hepatic lipase enzyme. Lipoprotein lipase helps remove LDL from the blood to the liver, then converted into bile or secreted so that LDL and cholesterol levels decrease. [23]

A study conducted by Glohamhasan et al in 2013 when looking at the relationship between physical activity and CHD risk factors in adolescents showing that the level of physical activity has a significant negative relationship with blood cholesterol and LDL levels. Although there is no significant relationship between physical activity with HDL and triglycerides but choosing an active lifestyle in addition to maintaining body mass index can also reduce excess body fat, this can prevent the occurrence of risk factors for coronary heart disease. [24]

In another study conducted by Fathia in 2016 that tested the relationship between physical activities with blood lipid profiles that showed a higher tendency in physical activity can lower blood cholesterol and triglyceride levels. [25] Furthermore, a study conducted by Kurniawati in 2015 concluded that there is a relationship between physical activity and LDL levels in patients with outpatient coronary heart disease in RSUD Dr. Moewardi with p value of 0,021. [26]

The relationship between physical activity with LDL levels conducted by Fatimah et al 2017 showed a correlation that is inversely proportional to LDL cholesterol levels with the results of correlation coefficient value -0.288 and p = 0.001 which means there is a relationship between variables. This is similar to the theory that after going through the process of digestion and absorption, the food will undergo formation into Acetyl-CoA then entering the Krebs cycle for ATP formation process, so the process of formation and transport of cholesterol throughout the body will decrease resulting in Low Density Lipoprotein (LDL) as a means of transporting cholesterol throughout the body is not much established, therefore LDL cholesterol levels decline. [27]

CONCLUSION AND SUGGESTION

This study can be concluded that the average difference of LDL levels in the group often consume sago and the group rarely consume sago (p = 0,000) and also there is no significant difference mean HDL levels in the group often consume sago and the group seldom consume sago p = 0.055). Thus, sago consumption patterns have an effect on LDL levels in the blood.

It is suggested to the government and society to increase their promotive and preventive efforts related to abnormalities in LDL and HDL levels as one of the risk factors of coronary heart disease. One of them by utilizing sago as one of the local staple food as a staple food that is high in fiber so it can normalize to LDL levels and maintain HDL levels and optimize in the development of processed sago so it can be consumed in various forms of alternative food.

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