

THE BAY LEAVES TEA CAN DECREASE CHOLESTEROL LEVELS OF PATIENTS WITH CARDIOVASCULAR DISEASE

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ABSTRACT

Background: Cardiovascular disease is the number one cause of death globally. Cardiovascular disease causes 75% of deaths that occur in countries with middle and low earnings in the world, one of them is Indonesia (WHO, 2015). The causes of cardiovascular disease are unhealthy diet, lack of activity, obesity, high cholesterol, age, etc. Bay leaves contain flavonoids, tannins, saponins, and niacin which can reduce cholesterol levels. **Objective:** The purpose of this study is to know the effect of bay leaves tea to reduce total cholesterol levels of patients with cardiovascular disease. **Method:** The type of research used is an experiment by pretest and posttest with a control group design. The treated group got 1 gram bay leaves tea twice per day in a week. The research samples were chosen by systematic random sampling with the total of treated group samples and control samples are 30 respondents each. Data analyses of this research are paired sample t-test and independent t-test. **Result:** The paired sample t-test showed that there was an effect of bay leaves tea towards total cholesterol, HDL and LDL with p-value (<0.05). The Independent t-test showed LDL has a significant difference between treated and control with p-value (<0.05). **Conclusion:** the bay leaves tea can decrease total cholesterol levels of cardiovascular patients especially the reduction of LDL level.

KEYWORDS: Cardiovascular, Cholesterol, Bay leaves tea, HDL, LDL.

INTRODUCTION

Cardiovascular disease is the number one cause of death in the world. In 2015 17.5 million people died each year from cardiovascular disease and an estimated 31% of deaths worldwide. Cardiovascular disease causes 75% of deaths that occur in middle and low-income countries in the world, one of them is Indonesia.^[1]

Cardiovascular disease is a disease caused by impaired heart and blood vessel function. The causes of cardiovascular disease are unhealthy diet, lack of activity, obesity, alcohol, smoking, high blood pressure, high cholesterol, diabetes mellitus, genetics, race and age.^[2]

According to Basic Health Research in 2013 the prevalence of coronary heart disease in Indonesia was 0.5% and the prevalence of events in South Sumatra was 0.4%. The results of reports for non-communicable diseases in 2009 in the health profile of South Sumatra Province in 2010, it was found that the prevalence of cardiovascular disease per 10,000 population of South

Sumatra for hypertension (53.36%), heart (30.55%) and stroke (0.75%).^[3]

Hypercholesterolemia is a disorder of fat metabolism characterized by high blood total cholesterol levels. High cholesterol levels will cause blockages in blood vessels so that circulation is disrupted. This reduces the amount of oxygen supplied to the heart which results in the occurrence of coronary heart disease.^[4]

How to deal with hypercholesterolemia in the blood can be done pharmacologically and non-pharmacologically. The utilization of vegetable materials for traditional medicine has been carried out by people in Indonesia. One of the vegetable ingredients used is a bay leaf (*Syzygium Polyanthum* (Wight) Walp), which is as cholesterol-lowering, hypertension treatment, diarrhea, gastritis and diabetes mellitus therapy.^[5]

A bay leaf contains tannin (citral, eugenol) essential oils and flavonoids.^[5] The bay leaf extract contains tannins, flavonoids with the main components are fluorescein and quercitrin. Bay leaf (*Syzygium Polyanthum* (Wight) Walp) has been investigated to contain flavonoids which

can show antioxidants and can control HDL cholesterol.^[6]

Based on data on the incidence of hypercholesterolemia in 2017 as many as 230 events in the Sekip Health Center and the impact of the researchers interested in research on the effect of bay leaf tea on total cholesterol levels in patients with cardiovascular disease at the Sekip Health Center in Palembang.

RESEARCH METHODS

This research is experimental with pretest and posttest with control group design. The independent variable in this study was 1 gram bay leaf tea and the dependent variable was total cholesterol, HDL, and LDL.

The subjects of this study were patients with cardiovascular disease with hypercholesterolemia in the working area of the Sekip Health Center in the city of Palembang. The study was conducted in January - April 2019. The inclusion criteria of this study were > 20 years old, total cholesterol levels above ≥ 240 mg / dL, patients with mild cardiovascular complications such as hypertension, taking simvastatin cholesterol-lowering drugs at a dose of 20 mg.

The determination of the respondents was done by a systematic random sampling method. The number of respondents was 30 each for each group. The treatment group got 1 gram bay leaf tea 2 times a day in 7 days of giving and consuming drugs, while the control group did not get treatment and only consumed drugs. Cholesterol levels were measured before the intervention was done using Lipid Pro and then measured again after being given intervention for 7 days. Nutrition status data were obtained using anthropometric measurements, while

respondent characteristic data was obtained using the respondent's identity form by direct interview.

The normality test uses the Kolmogorov-Smirnov test. Respondent characteristics were analyzed using descriptive analysis. Differences in blood cholesterol levels before and after the intervention of the two groups were tested by paired sample t-test. Differences in the effect of the treatment of the two groups on cholesterol levels were analyzed using the Independent t-test.

RESULT

Characteristics of Respondents

Characteristics of respondents consisting of gender, age, education, nutritional status, and physical activity are presented in table 1.

Table 1: Characteristics of Respondents.

Characteristics of Respondents	Treatment		Control	
	n	%	n	%
Gender				
Male	8	26,7	8	26,7
Female	22	73,3	22	73,3
Age				
30-49 years old	4	13,3	3	10,0
50-64 years old	18	60,0	19	63,3
65-80 years old	8	26,7	8	26,7
Education				
Primary	3	10,0	3	10,0
Intermediate	17	56,7	23	76,7
High	30	33,3	4	13,3
Nutritional status				
Normal	21	70,0	20	66,7
Overweight	9	30,0	10	33,3
Physical Activity				
Easy	3	10,0	3	10,0
Hard	27	90,0	27	90,0

The difference in average cholesterol before and after

The average total cholesterol, HDL, and LDL levels before and after the intervention are presented in table 2

Table 2: The difference in average cholesterol before and after.

Variable	Group	Before Mean \pm SD	After Mean \pm SD	p
Total of Cholesterol	Treatment	245.00 \pm 20.452	223.30 \pm 23.302	0.000
	Control	244.17 \pm 14.432	225.30 \pm 23.269	0.000
HDL	Treatment	52.47 \pm 10.305	55.13 \pm 7.314	0.007
	Control	52.74 \pm 14.368	57.50 \pm 15.021	0.002
LDL	Treatment	175.67 \pm 27.132	164.87 \pm 21.855	0.000
	Control	156.67 \pm 26.666	148.67 \pm 25.653	0.001

Effect of Giving Bay leaf Tea on Total Cholesterol Levels, HDL and LDL

The effect of bay leaf tea on total cholesterol, HDL, and LDL levels is presented in table 3

Table 3. Effect of Giving Bay leaf Tea on Total Cholesterol Levels, HDL and LDL.

Variable	Group	Difference Mean	t	p
Total of Cholesterol	Treatment	21.87	-0.333	0.741
	Control	18.87	-0.333	
HDL	Treatment	2.66	-0.777	0.440
	Control	4.76	-0.777	
LDL	Treatment	10.80	2.633	0.011
	Control	8.00	2.633	

DISCUSSION

Characteristics of respondents in this study were mostly female, aged 50-64 years with normal nutritional status, highly educated and having moderate activities.

Research shows that women have a greater risk of suffering from coronary heart disease (CHD) compared to men. In women, the absolute risk of CHD increases substantially in middle age because after menopause there is a change in fat metabolism.^[7] Women tend to have higher cholesterol levels after menopause when estrogen levels fall dramatically, and the risk of getting heart disease increases.^[8]

As someone ages. In men aged 45 years is a risk factor for CHD if their life habits are not good, including smoking, rarely exercising, hypertension and the habit of consuming high cholesterol foods. Women at the age of 55 years or experiencing menopause are risk factors for CHD. Before entering the menopause, women have a natural protector against heart disease, namely estrogen. Estrogen plays a role in maintaining high levels of HDL and low LDL.

Research shows that a person who has a BMI above normal tends to experience an increase in total cholesterol levels due to an increase in very-low-density lipoprotein (VLDL), low-density lipoprotein (LDL) and triglycerides compared with a person who has a normal BMI. Overweight occurs because of an imbalance of energy intake with the energy used. Excess energy will be stored in the form of fat and can cause interference with the regulation of fatty acids that will increase

triglyceride levels and cholesterol esters, thereby increasing the risk of hypercholesterolemia.

Regular exercise can reduce weight and reduce cholesterol deposits in blood vessels. By exercising, it can reduce LDL cholesterol and triglyceride levels and increase HDL cholesterol levels due to reduced liver lipase activity that functions in HDL cholesterol catabolism.^[11]

Research shows that bay leaves can reduce total cholesterol levels. The results showed that there was an effect of giving bay leaf boiled water on cholesterol levels in elderly hypercholesterolemia with Sig. (2-tailed) of 0.005 ($p < 0.05$).^[12]

The bay leaf contains tannin. Tannin is a bitter polyphenol that is good and quickly binds and shrinks protein. Tannin functions as an antioxidant, astringent, and hypocholesterolemic. Tannin reacts with mucosal protein and intestinal epithelial cells thereby inhibiting fat absorption. The Saponins function to bind cholesterol with bile acids, thereby reducing cholesterol levels. Saponins also contain vitamin A, vitamin C, vitamin E, and B3 and fiber.

A significant increase in serum HDL cholesterol levels after administration of the n-hexane fraction of bay leaf extract can be caused by the content of vitamin B3 (niacin) found in *Eugenia polyantha*.^[14] The niacin works by suppressing hepatic changes in Apo-A1 and suppressing the removal of Apo-A1 which done by the heart. This will increase the level of Apo-A1 as a

precursor of HDL, but niacin does not inhibit the hepatic change of HDL cholesterol esters.^[15]

Apo-A1 is an apolipoprotein compound which will form pre-beta HDL which will then be converted into mature alpha-HDL through the process of free cholesterol esterification into cholesterol esters with the help of the enzyme Lecithin-cholesterol acyltransferase.^[16]

Niacin reduces the formation of VLDL (very low-density lipoprotein) synthesized by the liver, which will consequently increase HDL cholesterol levels.^[17]

Bay leaf contains essential oils of 0.17%, citral, eugenol, tannin, flavonoids, and metal chavicol. One of the flavonoids contained in bay leaves is quercetin, a powerful antioxidant and able to prevent LDL (Low-Density Lipoprotein) oxidation. Flavonoids can also prevent the deposition of fat in the walls of blood vessels.^[13] According to Ekanda's research (2015) reported that flavonoids in bay leaves can reduce cholesterol levels where flavonoids work by inhibiting the enzyme HMG-CoA Reductase so that cholesterol synthesis decreases resulting in decreased blood cholesterol levels.^[18]

One of the compounds including flavonoid is quercetin. The mechanism of action of quercetin, which can reduce LDL cholesterol levels by inhibiting the secretion of Apo-B 100 on CaCO₂ cells and can reduce the activity of MTP (microsomal triglyceride transfer protein) which plays a role in the formation of lipoproteins by catalyzing the transfer of lipids to the Apo-B molecule. Quercetin can also inhibit the activity of the HMG-CoA reductase enzyme, an enzyme that plays a role in cholesterol formation.^[19]

This has an impact on the secretion of VLDL from liver cells which will result in a reduction in the conversion of VLDL to LDL. This mechanism causes a decrease in LDL cholesterol (Then et al, 2009). The nature of quercetin as an antioxidant can prevent LDL oxidation by binding to free radicals and the transition of metal ions in inhibiting lipid peroxidation.^[20]

Quercetin is a part of flavonoids as flavonols that are most commonly found in foods such as soybeans, asparagus, and other foods.^[21] Quercetin has the same mechanism as simvastatin in reducing LDL, other compounds found in bay leaves (niacin, tannins, and saponins).^[22]

Bay leaf contains bioactive compounds flavonoids quercetin, tannins and saponins which can reduce endothelial damage by reducing cholesterol and LDL levels through increased synthesis of bile acids. The production of bile acids requires cholesterol as a raw material so that with the increased secretion of bile acids, the total cholesterol level in the blood will decrease.^[21]

The content of niacin in bay leaves affects reducing LDL.^[23] In a study conducted on HIV patients, given niacin can reduce LDL levels and total cholesterol by 20% -30%.^[21]

Niacin suppresses the activity of the lipoprotein lipase enzyme by inhibiting the flow of free fatty acids from adipose tissue, thereby reducing the production of VLDL in the liver and can inhibit fat mobilization so that the production of total cholesterol and LDL cholesterol can decrease. The ability of niacin to reduce the formation of cholesterol in the liver can be caused by a decrease in the concentration of free fatty acids in the blood, and almost all fatty acids in the blood come from fatty tissue. Free fatty acids in circulation are the main source of fatty acids used for cholesterol synthesis in the liver. Therefore, a decrease in free fatty acid levels in the blood can reduce cholesterol synthesis.^[24]

Tannins work by reacting with intestinal epithelial mucosal protein cells thereby inhibiting fat absorption. The mechanism of tannin compounds in bay leaves against LDL levels is by inhibiting the action of the HMG-CoA reductase enzyme, an enzyme that plays a role in cholesterol formation. Tannin compounds can also reduce cholesterol levels in the body by binding to bile acids entering the small intestine absorbed and excreted through feces.^[18]

Saponins form a complex that is insoluble with cholesterol thereby preventing the absorption of cholesterol in the small intestine. Besides, saponins reduce the absorption of bile latex by forming micelles complexes that cannot be absorbed because their molecular weights are too large.^[25]

Saponin compounds have a high affinity for binding to and forming mixed food micelles (DMM) rather than cholesterol. As a result, this component replaces cholesterol from DMM, without affecting the concentration of bile salts included in the DMM. cholesterol will settle to form in large aggregates that cannot be absorbed by the intestinal wall.^[26] Low intracellular cholesterol levels result in a decrease in chylomicron formation.^[27] Remnant chylomicrons that reach the liver will decrease. This condition will stimulate LDL receptor synthesis. Besides, VLDL secretion by liver cells will decrease, causing the conversion of VLDL to LDL is reduced. This has an impact on reducing LDL levels in the body.^[28]

CONCLUSION

The bay leaves tea can decrease total cholesterol levels of cardiovascular patients especially the reduction of LDL level.

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