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Original Article

Effect of Black Sugar Cane Juice on Blood Cholesterol Levels Among Patients with Hypercholesterolemia

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ABSTRACT

In Indonesia, the 35.9% of population had total cholesterol levels of above the normal value, which was a combination of residents in the borderline category (total cholesterol value of 200-239mg/dl) and high category (total cholesterol value of >240mg/dl). On the other hand, 60.3% of population had LDL levels of above the normal value. Based on gender, the number of women with total cholesterol levels of above normal in was higher than men, and the number of people with total cholesterol levels of above normal in urban areas was higher than in rural areas. This study aims to determine the effect of black sugar cane juice on blood cholesterol levels among patients with hypercholesterolemia. This was a Quasi Experimental study with a pre-post test with control group design, conducted in the work area of Sapta Jaya Community Health Center, Aceh Tamiang in June 2022. The sample size of 52 people were assigned into 26 cases and 26 controls. The data collected included administration of black sugar cane juice and blood cholesterol levels. Data were analyzed using the dependent t-test and the independent t-test. Intervention was concluded to have an effect if the p value was <0.05. The dependent t-test analysis obtained mean values of blood cholesterol levels before and after administration of black sugar cane juice in the case group of 234.40 mg/dl and 201.54 mg/dl, respectively, which indicated a decrease of 32.86 mg/dl with a p-value of (0.006) <0.05. Furthermore, the independent t-test analysis in the case and control groups obtained p-values of (0.001) <0.05 and (0.003) <0.05, respectively. In conclusion, there was an effect of black sugar cane juice on blood cholesterol levels among patients with hypercholesterolemia. It is expected that patients with hypercholesterolemia consume black sugar cane juice because it can lower cholesterol levels.

Keywords : Blood Cholesterol Levels, Black Sugar Cane Juice, Hypercholesterolemia.

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INTRODUCTION

The prevalence of hypercholesterolemia according to a doctor's diagnosis was 2.3%, the prevalence of heart failure was 0.3% and the prevalence of stroke was 62.8%[1]. The prevalence of hypercholesterolemia, heart failure, and stroke seems to increase with an increase in age of the respondents. High number of heart disease cases is due to the lifestyle of people who like to consume high-cholesterol foods and sweet foods by 90% of the population of Banda Aceh City[1].

Hypercholesterolemia is one of the most common forms of hyperlipidemia, which is a metabolic disorder characterized by an increase in total cholesterol levels in the blood. Cholesterol levels are said to be increased if the total cholesterol level in the blood is more than 240 mg/dL, Low Density Lipoprotein (LDL) is more than 160 mg/dL, and High-Density Lipoprotein (HDL) is less than 40 mg/dL.2 An increase in blood cholesterol levels increases

the risk of cardiovascular disease[2].

Hypercholesterolemia can increase the risk of atherosclerosis, coronary heart disease, pancreatitis (inflammation of the pancreas organ), diabetes mellitus, thyroid disorders, liver disease & kidney disease. Influential factors of hypercholesterolemia include heredity, consumption of high-fat foods, lack of exercise and smoking habits[3].

Educative and preventive efforts need to be performed. In Indonesian society, the management of hypercholesterolemia includes non-pharmacological therapy called therapeutic lifestyle change (TLC) and pharmacological therapy in the form of cholesterol-lowering drugs. Personal education is also one of the roles of health services in creating changes in lifestyle and eating patterns. Unlike pharmacological treatment, non-pharmacological treatment does not have harmful side effects, so that people prefer non-pharmacological rather than pharmacological treatment. One of the non-pharmacological natural treatments for the management of hypercholesterolemia is herbal therapy[4].

The use of natural ingredients to treat and prevent disease has been widely practiced by people around the world and currently, there is an increase in the intention to conduct studies related to the activities of natural ingredients. Many studies used plants with properties as traditional medicines that had been widely used by the community in treating diseases. Apart from being cheap and easy to obtain, traditional medicines also have fewer side effects compared to synthetic chemical drugs[5].

Sugar cane (Saccharum officinarum L) is a plant grown for sugar and MSG raw materials. This plant is a type of grass which can only grow in tropical climates. Sugar cane juice is in great demand and is widely known as a fresh drink that tastes sweet and is quite economical. Sugar cane contains the octacosanol compound, a type of long-chain alcohol that can lower cholesterol levels in the blood[5]. Octacosanol is a natural, long-chain saturated alcohol found in black sugar cane. Octacosanol is an aliphatic alcohol which has the effect of lowering lipid levels in plasma of both humans and animals. Octacosanol can reduce cholesterol synthesis by inhibiting HMG-CoA reductase. However, octacosanol does not reduce HMG-CoA reductase by more than 50%, thus showing its safety in the case of toxicity[7].

There are many natural ingredients that can lower cholesterol levels, but in this study, the researchers are very interested in black sugar cane since it can be found a lot around, but no one knows the efficacy of this plant. In addition to its availability, such plant has a very economical price with many benefits, one of which is its effectiveness to lower blood cholesterol levels[6]. This study aims to determine the effect of sugar cane juice on blood cholesterol levels among patients with hypercholesterolemia.

METHOD

This was a Quasi Experimental study with pre and post-test control group design. This study intends to assess the data of study subjects before and after being given an intervention. The study samples were selected using purposive sampling technique. The subjects in this study were patients with hypercholesterolemia who met the inclusion criteria in the work area of Sapta Jaya CHC, Aceh Tamiang as many as 52 people. The sample size was calculated using the Slovin formula.

The study variables consisted of administration of 220 ml of black sugar cane juice once a day for 7 consecutive days that was determined using a measuring cup, and blood cholesterol levels as measured using Easy Touch tool. Black sugar cane juice was made by peeling the skin of I kg of black sugar cane, washing it and cutting it and then grinding it to obtain 220 ml of black sugar cane juice. The inclusion criteria included patients aged 40-60 years, regardless of gender, , patients who were still conscious and could be talked to, had no other disease complications, did not take cholesterol medication, consumed black sugar cane juice for 7 days, and those who were willing to be the study samples by signing an informed consent. Researchers assigned the study samples into two groups, namely the treatment group that was administered with black sugar cane juice and the control group without treatment that was administered with plain water as a placebo. All study samples were examined for blood cholesterol levels before and after treatment for 7 days. Data were processed and analysed using the dependent and independent t-test statistical tests with a 95% confidence level ($\alpha = 0.05$).

RESULTS

Table 1. Characteristics of Patients with Hypercholesterolemia by Gender, Age, Level of Education and Occupation at Sukajadi Village, the work area of Sapta Jaya CHC, Aceh Tamiang.

Variable	Treatment (n=52)	Control (n=52)
Gender		
Male	4	7
Female	22	19
Age		
36-45	14	8
46-55	9	18
56-65	3	-
Level of Education		
High (S1/DIII)	7	7
Secondary (SLTA/SMK)	12	14
Primary (SD/SLTA)	7	5
Occupation		
Housewife	10	12
Government Employee	8	2
Self-employed	5	7
Farmer	2	4
Healthcare Worker	1	1
Period of Hypercholesterolemia		
< 12 months	17	17
> 12 months	9	9

Based on Table 1, it can be seen that most of patients with hypercholesterolemia in the treatment group were female by 53.7%, in the adult age category by 63.6%. Meanwhile, most of patients with hypercholesterolemia in the control group had secondary education by 53.8% and were housewives (IRT) by 54.5%. Furthermore, regarding period of hypercholesterolemia, the treatment and non-treatment groups had the same proportion of patients by 50.0%.

Table 2. Mean Blood Cholesterol Levels Before and After Treatment in the Treatment and Control Groups at Sukajadi Village, the Work Area of Sapta Jaya CHC, Aceh Tamiang.

Blood Cholesterol Levels	Group					
	Treatment			Control		
	Mean	Min	Max	Mean	Min	Max
Before	233.35	220	240	235.46	200	240
After	164.81	150	185	238.27	230	245

Based on table 2, it can be seen that the mean blood cholesterol levels before and after administration of black sugar cane juice were 235.35 mg/dl, and 164.81 mg/dl, respectively. On the other hand, in the control group, it can be seen that the mean blood cholesterol levels before and after administration of plain water were 235.46 mg/dl and 238.27 mg/dl.

Table 3. Effect of Black Sugar Cane Juice on Blood cholesterol Levels among Patients with Hypercholesterolemia at Sukajadi Village, the Work Area of Sapta Jaya CHC, Aceh Tamiang.

Group	Cholesterol Levels Before Treatment			Cholesterol Levels After Treatment			p- value
	Mean	N	Std. Deviation	Mean	N	Std. Deviation	
Case	233.35	26	6.591	164.81	26	11.179	.001
Control	235.46	26	8.613	238.27	26	3.935	.003

After calculations for the case and control groups before and after treatment, it was found a difference. In the case group, it was obtained a p value of (0.001) <0.05 with mean blood cholesterol levels before and after intervention of 233.35 mg/dl 164.81 mg/dl, respectively. Based on such finding, it was revealed a decrease in blood cholesterol level in the case group of 68.5 mg/dl. Furthermore, in the control group, it was obtained a p value of (0.003) <0.05 with mean blood cholesterol levels before and after intervention of 235.46 mg/dl 238.27 mg/dl, respectively. Based on such finding, it was revealed that there was no decrease in blood cholesterol level in the control group.

DISCUSSION

The study findings revealed that the mean blood cholesterol levels before and after administration of black sugar cane juice were 235.35 mg/dl, and 164.81 mg/dl, respectively. On the other hand, in the control group, it can be seen that the mean blood cholesterol levels before and after administration of plain water were 235.46 mg/dl and 238.27 mg/dl. The results of the dependent t-test on blood cholesterol levels before and after administration of black sugar cane juice in the treatment group obtained a p value of ≤0.05 at a 95% confidence level. Thus, it can be concluded that there was an effect of administration of black sugar cane juice on blood cholesterol levels. The mean value of blood cholesterol after administration of black cane juice showed a decrease. One way to reduce excess cholesterol levels in the body is by using herbs. One of the herbs that can lower cholesterol levels is black sugar cane which is processed into black sugar cane juice to make it easier to consume, especially to lower the cholesterol levels.

This study confirms that black sugar cane is very good to be given to lower blood cholesterol levels. Black sugar cane is one of the sweetest drinks with quite economical price. Sugar cane contains the octacosanol compound, a type of long-chain alcohol that can lower cholesterol levels in the blood. The existence of Saccharum officinarum L., which is common in the community and easy to obtain, is expected to facilitate education and introduction of Saccharum officinarum L. to the public as an alternative ingredient in reducing dyslipidemia as well as preventing deadly heart disease, especially among those with hypercholesterolemia. According to a study conducted by the National Center for Scientific Research Havana Cuba, octacosanol suppresses the synthesis of cholesterol which is produced in the liver. This can be seen from the regulation of the HMG-CoA-Enzyme reductase which limits the rate of cholesterol synthesis[8].

Long-term observations of octacosanol consumption prove that the compound can lower and control blood cholesterol levels without side effects. Administering octacosanol per day showed a decrease in total cholesterol by 17.5%, and LDL-cholesterol by 21.8%. However, HDL–Cholesterol levels increased by 11.3%[9].

Sugar cane juice not only contains octacosanol, by also a saccharant compound which functions as an antidiabetic. Thus, it is safe for consumption by people with diabetes. Sugar cane juice had also been studied and it was found to contain lots of Vit B2 (riboflavin)[10]. Sugar cane also contains fatty acids which have anti-inflammatory and analgesic effects. This was proven by administering a mixture of fatty acids isolated from sugar cane to rats. Sugar cane has alkaline properties, so it can help fight breast and prostate cancer[11].

A study conducted by Mulyani, NS (2018) observed the effect of black sugar cane juice on blood cholesterol levels in mice[12]. The results of assessments in rat blood showed a significant difference in cholesterol levels between the control group and the case group with a p-value of (0.003). The mean cholesterol level in the case group was much higher (0.000). The study finding showed a significant difference in cholesterol levels between the control and case groups[12].

The study finding is in line with the study conducted by Hidayati, N (2018) is study which was also conducted with experimental animals of mice[13,]. It was found that black sugar cane juice could decrease blood cholesterol levels in mice, with a significant difference between the treatment and control groups[13,14].

A study conducted by Pratiwi N. (2018) observed differences in blood cholesterol levels before and after administration of black sugar cane juice among patients with hypercholesterolemia in outpatient department of Banyuwangi General Hospital, Central Java. From this study, it can be concluded that there

was a difference in blood cholesterol levels before and after administration of black sugar cane juice among patients with hypercholesterolemia in outpatient department of Banyuwangi General Hospital, Central Java [15, 16].

Another study conducted by Puspaningrum, et al (2021) entitled the effect of black sugar cane juice on lowering cholesterol levels showed a decrease in cholesterol levels in the experimental group and the control group by 29.4mg/dL and 16.8 mg/dL, respectively[16]. It can be concluded that the intervention in the experimental group was more effective in lowering cholesterol levels than intervention in the control group with a p value of 0.000 ($p < 0.05$)[17, 20].

CONCLUSION

Black sugar cane juice was effective to lower cholesterol levels among patients with hypercholesterolemia in the work area of Sapta Jaya CHC, Aceh Tamiang. It is expected that this paper can provide information to the public about the benefits of black sugar cane juice for lowering blood cholesterol levels among patients with hypercholesterolemia.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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