



THE EFFECT OF CONSUMING CELERY-CARROT PUDDING ON THE CHOLESTEROL LEVEL OF HYPERCOLESTEROLEMIA IN ASPOL KOBLEN BUBUTAN SURABAYA

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ABSTRACT

Background: Hypercholesterolemia is a common clinical situation that lipoprotein metabolic disorder characterized by elevated serum low density lipoprotein and blood cholesterol and considered as one of the significant important risk factors of atherosclerosis that leads to cardiovascular diseases. Prevention and relapse of such circumstances depends on diet and cholesterol control. One of the most effective herbal therapies is the consumption of celery and carrots in attempts to control cholesterol levels. This study aims to analyze the effect of giving celery-carrot pudding on cholesterol level changes in patients with hypercholesterolemia in Aspol Koblen Bubutan Surabaya. **Methods:** Pre experimental research design with one group pretest-posttest design. Sample Population of hypercholesterolemia patient Aspol Koblen Bubutan Surabaya with sample number 17 respondents selected by non probability sampling approach. The research instrument used cholesterol observation sheet. Data were analyzed by using paired t test. **Results:** The results described average cholesterol levels 257 mg / dl before treatment and after treatment to 204 mg / dl. The result of paired t test showed the effect of giving celery combination of carrot pudding to cholesterol level change with $p < 0.001$ ($p < 0.05$). **Conclusion:** The implication of this research is celery-carrot pudding could decline lower cholesterol level in hypercholesterolemia patient, so for hypercholesterolemia patient should consume celery-carrot pudding as one of non pharmacologic treatment to decrease cholesterol level.

Keywords: hypercholesterolemia, celery pudding, carrots.

INTRODUCTION

People's lifestyles have changed, this change is somewhat influenced by the increase in welfare and public indifference to the type of food eaten, which in fact has changed the type of healthy food intake to the type of food favored by society (Prakoso, 2006). Eating foods such as continuous ingestion of elevated levels of triglycerides, cholesterol and saturated fats intake are believed to be directly related to hypercholesterolemia. Many people are accustomed to cooking the kind of food they think is delicious without regard to the nutritional content of the dish rather

than cooking a healthy diet. Some of the families in the community even rarely consume vegetables, so many of their children do not want to eat vegetables because they are not used to eating vegetables in the family, which is actually very beneficial to the vegetable body (Hananta & Freitag, 2011).

Type of unhealthy food and not balanced nutrition menu will gradually lead to degenerative disease that is the type of illness resulting from wrong food / wrong choice of food. Cholesterol is a substance that is required by the body for the construction of the body's cell



membrane, the material of making steroid hormones, bile salts for the digestion of fat and so on. But cholesterol levels are too high in the body is very dangerous because it can cause embankments in the blood vessels, narrowing of blood vessels and even rupture of blood vessels (Hananta & Freitag, 2011).

Hypercholesterolemia condition characterized by very high levels of cholesterol in the blood. Hypercholesterolemia is a condition in which cholesterol levels increased along with elevated LDL cholesterol in plasma in a fasting state. Cholesterol is a serious health problem worldwide. In 2002, WHO reported that the incidence of dyslipidemia accounted for 8% of the total disease in the developed world (Bild, 2012). Cardiovascular disease is very diverse, one of the highest risk factors of this disease is hyperlipidemia (Nelson, 2013). Hypercholesterolemia is defined as elevations of fasting total cholesterol concentration which may or may not be associated with elevated TG (Jelinger et al, 2017). Data obtained from The National Heart Lung and Blood Institute of 2001 show that age and gender influence the incidence of hypercholesterolemia (Hartmann et al, 2015). One in three Americans are at risk of hypercholesterolaemia. More than 36 million adolescents have extreme cholesterol levels of > 240 mg / dL (Nelson, 2013). Hypercholesterolemia in males over 20 years is about 48% of whites, 45% black. Whereas in women over 20 years about 50% in white women and 42% of black women (Dahm et al, 2006) . In addition to the age of 20 years, hypercholesterolaemia most commonly

affects people aged 65-75 years with a risk 4 times greater (Bild, 2012).

Hypercholesterolemia in RISKESDAS 2013 showed that the older age, the average value tends to increase, ie in the age group 55-64 years of 2.7 and age > 65 years by 2.1%. Meanwhile, the prevalence of hypercholesterolemia in Indonesia is 1.5%. In men 0.6% and 2.2% in women (Depkes RI, 2013). Among teenagers aged 15-17 years have started experiencing hypercholesterolaemia (Hidayati, 2006; Malik, 2013; Ujiani, 2015).

Hypercholesterolemia is a condition characterized by very high levels of cholesterol in the blood. Cholesterol is a waxy, fat-like substance that is produced in the body and obtained from foods that come from animals (particularly egg yolks, meat, poultry, fish, and dairy products). The body needs this substance to build cell membranes, make certain hormones, and produce compounds that aid in fat digestion (Kumar, 2007).

People with hypercholesterolemia have a high risk of developing a form of heart disease called coronary artery disease. This condition occurs when excess cholesterol in the bloodstream is deposited in the walls of blood vessels, particularly in the arteries that supply blood to the heart (Ayoka, 2005). The abnormal buildup of cholesterol forms clumps (plaque) that narrow and harden artery walls. As the clumps get bigger, they can clog the arteries and restrict the flow of blood to the heart. The buildup of plaque in coronary arteries causes a form of chest pain called angina and greatly increases a person's risk of having a heart attack. Excess cholesterol will be transported back by HDL lipoprotein (High Density



Lipoprotein) to be brought back to the liver which will then be described and then thrown into the gallbladder as bile. LDL contains much more fat than HDL so it will float in the blood. LDL is considered a "bad" fat because it can cause the attachment of cholesterol in the walls of blood vessels. While HDL is referred to as "good" fat because in its operation HDL cleans the excess cholesterol from the blood vessel wall by transporting it back to the liver (Berawi & Asvita, 2016).

In addition to lifestyle arrangements, the following are prescribed medications that can lower blood cholesterol levels according to the National Heart Lung and Blood Institute (Bild, 2012). There are several classes of drugs, including statins (atrovastatin, fluvastatin, lovastatin, pravastatin, rosuvastatin, cerivastatin, simvastatin), resins (cholestyramine), nicotinic acid groups (niacin), ezetimibe and omega-3 fatty acids (Karch, 2011; Bild, 2012; Csonka, 2016). Various studies supporting the scientific evidence of the above drugs can effectively lower serum cholesterol levels, but also cause side effects (Bild, 2012). Drugs produced by the pharmaceutical industry are of many kinds, but their long-term use is reported to have side effects (constipation, hypersensitive reactions, anorexia, alopecia, etc.) so that people use herbs to treat metabolic disorders (Nies, 2006; Nelson 2013). Non-pharmacological treatments include weight loss, regular exercise, low-fat & salt diet, and complementary therapies (Dahm et al, 2016).

Life style modification is the first step to reduce cholesterol levels. Changes in diet, weight loss and increased exercise are known to be effective. (Nelson, 2013)

Many people prefer complementary and alternative medicines to pharmaceutical products. They want to use these products because they are less expensive to purchase, don't require a prescription and are considered natural. While there are no studies demonstrating that an alternative product is superior to statins in either lipid or CVD reduction, several reviews have shown modest reduction of plasma lipids with the use of substances such as garlic, nuts, carrot and celery (Nies et al, 2006).

Celery, despite its healthy reputation, was at one point considered a poor vegetable choice for dieters because of its sodium content. A 100-gram serving of raw celery contains 80 milligrams of sodium, about 3 percent of your daily requirement. At less than 5 percent, however, this amount is actually considered low by the Food and Drug Administration (Kooti et al, 2015). Based on the results of research Suwarso & Anggraeni (2014) about the effect of a combination of infusion effect celery to cholesterol levels explained that there is influence of infusion of celery to cholesterol levels. Several kinds of medicinal plants contain anti-oxidant and lipid-lowering effect levels and improve lipid profiles (Suanarunsawat et al., 2011). Celery (*Apium graveolens* L.) is an aromatic vegetable plant used as food and considered as an important medicinal herb. The researchers see the need for herbal therapy in the consuming of celery-carrots pudding in decrease cholesterol levels in patients with hypercholesterolemia.

METHODS

This research used pre-experimental research design with one group pre-test-post test approach. The population in this



study was hypercholesterolemia patients in Aspol Koblen Bubutan Surabaya as many as 17 subjects. The sample technique were used non probability sampling by total sampling. The independent variable in this research was carrots celery pudding. Dependent variable was the change of blood cholesterol level. The entry criteria for the studt were respondents with a history of hypercholesterolemia aged over 36 years, Respondents who are willing to be researched, Respondents who do not consume hypercholesterolic drugs, Respondents who have no history of gastritis. We excluded respondents who have complication disease such IMA or CVA. Research instruments used blood cholesterol observation sheets, Cholesterol Stick Easy Touch GCU. Data were analyzed by using paired t test. Date were collected from March – April 2017

RESULTS

Table 1. Selected sociodemographic variables of study participants (n= 17)

| Characteristic | | (%) |
|------------------------------------|-----------------|-----|
| Age | 36-45 years old | 15 |
| | 46-55 years old | 30 |
| | 56-65 years | 40 |
| | 66-75 years old | 10 |
| | > 75 years | 5 |
| Duration of hypercholesterolemia | <1 year | 55 |
| | 1-6 years | 35 |
| | > 6 years | 10 |
| History of Familiy | Yes | 60 |
| | No | 40 |
| The habit of consuming fatty foods | Rarely | 65 |
| | Never | 35 |
| The habit of consuming coffee | Often | 15 |
| | Rarely | 45 |
| | Never | 40 |
| The habit of consuming alcohol | Rarely | 5 |
| | Never | 95 |
| Smoking habit | Often | 20 |
| | Rarely | 10 |
| | Never | 70 |
| Respondent's activity | Light | 65 |
| | Both | 35 |

Based on Table 1, the majority of respondents were women (aged 56-65 years old), as many as 11 respondents (65%), for the duration of cholesterol the majority of respondents between 1-6 years, the majority of respondents were housewives as many as 7 respondents (50%), the majority of whom had a family history of hypercholesterolemia as many as 9 respondents (60%), the majority of which consumed 13 fatty foods (65%), the majority of coffee consumption was rare, 6 respondents (45%), alcohol consumption was never 16 respondents (95%), the majority of smoking habit was never 11 respondents (70%), the majority of respondents activity was light activity amounting to 13 respondents (65%),

Table 2 changes cholesterol levels in participants

| | Mean | Min-max value | Mean difference | P |
|--------|-----------|---------------|-----------------|---------|
| Before | 257 mg/dl | 205-337 mg/dl | 53 | < 0.001 |
| After | 204 mg/dl | 165-247 mg/dl | | |

Based on the above table shows that from 17 respondents in Aspol Koblen Bubutan Surabaya the average value of cholesterol before giving celery- carrot pudding was 257 with the lowest cholesterol value was 205, and the highest was 337, while the cholesterol value after consuming of carrot celery pudding is 204 with the lowest cholesterol value is 165, and the highest is 247. In addition, according to table 3 it can also be seen that from the statistical test using paired t test with 95% significance level ($\alpha = 0.05$) obtained P value <0.001. This indicates



that $P < 0.05$ which means that there is influence in the consuming of celery-carrot pudding to cholesterol changes in Aspol Koblen Bubutan Surabaya.

DISCUSSION

Based on table 3 shows that from 17 respondents, the average cholesterol level was 257 mg / dl with the lowest cholesterol level of 205 mg / dl and the highest was 337 mg / dl with standard deviation 34,26. Statistical test results using paired t test with 95% significance level ($\alpha = 0.05$) obtained value $P < 0,001$. This indicates that $P < 0.05$ which means celery – carrot pudding effective to changes in cholesterol levels in Aspol Koblen Bubutan Surabaya. In general, people with hypercholesterolemia are said to have increased cholesterol value if cholesterol levels more than 200 mg / dl. One of the factors that influence the occurrence of hypercholesterolemia is a lifestyle factor such as the habit of eating fatty foods (Dasanti,2011). This is in accordance with the results of the study that the majority of respondents ie 13 respondents (65%) have a habit often consume fatty foods and the remaining 4 respondents (35%) rarely consume fatty foods. aged 55-65 years as many as 8 respondents (40%). According Septianggi & Sulitya (2013) from several epidemiological studies indicate that hyperlipidemia plays an important role for the occurrence of coronary heart disease. Atherosclerosis in particular CHD is associated with a number of risk factors for grease, hypercholesterolemia and lack of exercise. AACE (American Association Of Clinical Endocrinologists) mentions the deaths due to disease due to higher lifestyle changes in developing countries

than in developed countries (Jellinger, 2017).

One of the factors that influence the occurrence of hypercholesterolemia is the age factor. The health problems of elderly people over 55 years of age are becoming increasingly important. One of the main causes of death in elderly people is coronary heart disease induced by hyperlipidemia (Nelson, 2013) . This is in linear with the results of the study that the majority of respondents aged 55-65 years as many as 8 respondents (40%). Cholesterol levels are also affected by age, and increase with age. This is a reflection of the duration of exposure to risk factors. (Nies, 2006).

Another factor that can affect hypercholesterolemia is gender. Based on the results of observation found that the majority of patients with hypercholesterolemia female sex as many as 14 respondents (70%). Of these, the majority are aged 56-65 years. The older the human, the cholesterol level will increase. Before the age of menopause, women have lower total cholesterol levels than men of the same age. After menopause, LDL cholesterol levels in women tend to increase. Dahm (2016) found that menopause is the cause of increased cholesterol levels. Ellyya (2001) also stated, the decline in estrogen hormones during menopause and perimenopause can cause bad cholesterol (LDL) in the body soaring. After entering menopause, the hormone estrogen in the body of women is decreased dratis. In fact, estrogen is important in helping to control cholesterol levels. Estrogen is not just a hormone in women. This hormone can also function as an antioxidant. However, in men at high risk of



hypercholesterolemia early, this can be caused by lifestyles that tend to increase hypertension, such as smoking, and drinking coffee. According to Diarti (2016) the risk of CHD in men with cholesterol greater than 250 mg / 100 dl is 3.5 times compared with less cholesterol 180 mg / dl. In men under 50 years of LDL cholesterol is a strong indication for the risk of CHD and death in white men aged 35 -55 years and 5 times higher than women. The increase in LDL cholesterol is thought to be due to high saturated fatty acids that will suppress mediated clearance receptors from LDL thus disrupting the transport of LDL in the circulation (Hartmann, 2015).

Based on the habit of consuming fatty foods, it was found that the majority of respondents as many as 13 respondents (65%) often consume fatty foods. Based on the results of questionnaire interviews, respondents stated that often cook with ingredients containing coconut milk and fat, such as curry, lodeh, rendang, etc. for several days. Foods that contain many bad fats (LDL) can cause fat accumulation along the blood vessels so that blood vessels narrowed that can lead to blood flow becomes less smooth and cause the heart will pump even stronger to supply the needs of blood to the network resulting in increased blood pressure and hypertension (Beck, 2011). This is supported by the statement of Csonka (2016) which stated that saturated fat consumption habits are closely related to weight gain at risk of hypercholesterolaemia, and increases the risk of atherosclerosis associated with elevated blood pressure. This is in line with Widiantari (2014) study which states that the risk of hypertension is 8.7 times

higher in people who consume fat than those who do not consume fat, and Siringoringo et al (2013) studies suggest that there is a relationship between fat consumption and the incidence of hypertension. From the above statement, researchers assume that fatty foods can affect the increase in blood pressure because it can cause the accumulation of plaque in the blood vessels resulting in narrowing of the arteries, and can increase body weight that result in the amount of fat deposits in the body that can aggravate the body's organs, become slow and the heart work more severe which in the end can occur hypertension. Healthy diet during adolescence is associated with lower risk of developing CVD risk factors. As diet tracks throughout life and adult diet prevents CVD, Healthy dietary habits that begin early are important for primordial prevention of CVD (Dahm et al, 2016).

Based on alcohol consumption habits, it was found that the majority of respondents as much as 19 respondents (95%) never consumed alcohol. Alcohol can increase blood acidity because the blood becomes thicker, causing the heart to pump blood stronger so that blood to the tissues and alcohol can also damage the central nervous function and the edge (Shahat et al ,2017). This is due to alcohol increase sympathetic nerve activity because it can stimulate the secretion of Corticotropin Releasing Hormone (CRH) resulting in increased cholesterol (Kumar, 2007). The theory is supported by Nelson (2013) statement that consuming alcohol at least twice a day can result in systolic blood pressure rising 1.0 mmHg (0.13 kPa), and diastolic blood pressure 0.5 mmHg (0.07 kPa) per one drink.



Based on the habit of cigarette consumption, it was found that the majority of respondents as many as 14 respondents (70%) never consume cigarettes. Cigarettes contain thousands of harmful chemicals to the body, such as tar, nicotine, and carbon monoxide gas. Nicotine stimulates the rise of adrenaline hormones from adrenal that cause heart palpitations, increase blood pressure, and blood cholesterol levels (Hartmann et al, 2015). This is in line with Widiantari (2014) study which states that hypertension risk is 6.9 times higher in people who smoke, compared with non-smokers.

Respondents were interviewed concerning their levels of activities as categorized in light, medium or heavy levels. The majority of the respondents stated that mostly they carried out light activities (65%). This result is in line with Sugiharto (2007) study that hyper risk 2.67 times greater in people less activity than many activities. This result is also supported by the results of research According to Nelson (2013) from several epidemiological studies indicate that hyperlipidemia plays an important role for the occurrence of coronary heart disease.

Based on Table 3 shows that from 17 respondents, the average blood cholesterol level of 257 mg / dl before the provision of carrot combination celery pudding, however, after the consuming of celery - carrot pudding, the majority of the blood cholesterol of respondents to 204 mmHg. This can be seen with the use of herbal therapy as a non-pharmacological treatment of hypercholesterolemia. Nonpharmacologic treatment is often an alternative to control, and can be used as a complement to medical treatment (Kooti et

al, 2015). Utilization of herbs for health care and disease disorders to date is urgently needed and needs to be developed, especially with surging medical expenses. The tendency of the use of natural medicine / herbs in the world is increasing with the rise of back to nature movement which is motivated by environmental change, human life pattern, and disease progression. This is supported by Suwarso and Anggraeni (2014) who stated that medicinal plants have an advantage in the treatment of blood cholesterol levels because it has the function of treating complications resulting from high blood cholesterol levels in addition to treating blood cholesterol levels themselves, and has very little side effects. One of the blood cholesterol controller is to consume lots of vegetables and fruits, including celery and carrots (Astawan, 2008; Dalimartha, 2013; Muhlisah, 2013).

Celery contains flavonoids (graveobioside A, graveobioside B, apiin, and apigenin), saponin, 1% tannin, 0.033% asiri, neocnidilide, alpha-selinene, phenolic acid, glycolic acid, acetylenic, choline, lipase, asparagine, folic acid, minerals (potassium, calcium, phosphorus, magnesium, sodium, and silicon), vitamins (A, C, B1, B2, and B6), fibers and coumarins in which there are 3-n-butylphthalide, DL-butylphthalide and bergapten compounds (Kooti et al, 2015). Celery is beneficial to lower blood cholesterol levels because in celery there are components of phthalides that can relax the blood vessels, and reduce stress hormones that can increase blood pressure. In addition, the content of L-tryptophan compounds contained in celery serves as an antioxidant that can prevent



atherosclerosis by inhibiting oxidative processes that can lower cholesterol levels in the blood (Shahat et al, 2017). Fresh carrots contain water, proteins, carbohydrates, fats, fiber, ash, anticancer nutrients, natural sugars (fructose, sucrose, dextrosa, lactose, and maltose), minerals (calcium, phosphorus, iron, potassium, sodium, magnesium, manganese, copper, chromium and glutathione), vitamins (A, B1, B6, C, E, and K), pectin, biotin, folic acid, carotenoids (beta carotene, alpha carotene, lutein and lycopene), phytofluene, umbeliferone, caffeic acid, chlorogenic acid, crackic acid, luteolin-7-glucoside, pyrrolidine, and asparagine (Sunardi, 2015). Adequacy of water in the body will help remove toxins from the body (Kristanti, 2010).

Pectin contained in carrots is one type of soluble dietary fiber that plays an important role to reduce cholesterol and blood sugar levels, so it is useful to prevent diabetes mellitus and atherosclerosis (narrowing of blood vessels) which is the forerunner of the disease coronary heart disease and stroke (Astawan, 2008). This is supported by a study by Suwarso & Anggraeni (2014) that infusion of celery can lower cholesterol levels in mice test animals.

Based on this, it was found that the pudding celery carrot combination has an effect on the changes of cholesterol levels in patients with hypercholesterolemia in Aspol Koblen Bubutan Surabaya. In addition, from the above statement can be concluded also that the celery-carrot pudding affect the changes in cholesterol in the body. This is due to the presence of L-tryptophan and pectin which can absorb and lower cholesterol levels in the body

CONCLUSIONS

Based on the findings of this study, Celery-carrot pudding has a positive influence in improving cholesterol blood level with mean difference of 53 mg /dl. For respondents it is expected that patients with hypercholesterolemia who do not consume drugs can use a pudding celery carrot combination as a non-pharmacological treatment of hypercholesterolemia in order to stabilize or decrease cholesterol. For research sites it is expected that this research can be used as consideration in the management of hypercholesterolemia in non pharmacology in order to stabilize or lower cholesterol. For further research It is expected that this research can be used as a reference to conduct further research with designs, instruments, and more representative variables.

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