Effect of Avocades to LDL Cholesterol as a Preventive Risk of Atherosclerosis

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Abstract

Objective: Cardiovascular disease is the highest cause of death in most developing countries. Hypercholesterolemia, especially high LDL is a risk factor for cardiovascular disease can be overcome through a good diet. Avocado fat is included in healthy fats, because it is dominated by monounsaturated fatty acids oleate. Based on the description, it is necessary to do research on the effect of avocado juice on lipid profiles in humans

Method: This study used a pre and post test only control group design research method to determine the effect of avocado juice on LDL cholesterol in humans. Before the study began (H-7) participants were asked not to consume avocados, then at the beginning of the study blood was taken to check for LDL cholesterol. After that, the study participants were given avocados made in the form of juice for 14 days to then check the LDL cholesterol again and compared the results

Result: There was a statistically significant decrease in LDL cholesterol levels after giving avocado juice for 14 days with p 0.003

Conclusion: Avocado juice has a good effect that can decreased LDL cholesterol level and has a protective effect on the risk of atherosclerosis

Keywords: Avocado, LDL cholesterol, Preventive risk, Atherosclerosis

Introduction

Atherothrombosis is a disease with high mortality and morbidity. Although it can cause interference with arterial branching anywhere in the body, the main clinical manifestations are coronary heart disease (CHD), cerebro vascular disease and occlusive arterial disease in the lower extremities.[1,2] Cardiovascular disease is the highest cause of death in most developing countries. Most deaths from cardiovascular disease can be prevented through lifestyle improvements such as diet, exercise, and stop smoking. For example, approximately 37% of heart attacks in women are associated with being overweight. In addition, hypercholesterolemia, which is a risk factor for cardiovascular disease can be overcome through a good diet in approximately 75% of individuals. Decrease in input from saturated fat, cholesterol and increased input from foods that can reduce cholesterol should be given top priority as prevention for cardiovascular disease.[3]

In recent decades, understanding the pathogenesis of atherosclerosis has undergone a revolution. Previously it was thought that atherosclerosis had a basic problem with blood vessels only. Understanding the pathophysiology of this disease has entered a new era by understanding the pathobiology of atherothrombosis.[4] Atherosclerosis is a disease caused by an inflammatory process and abnormalities in fat metabolism. Initially understanding of the pathophysiology of atherosclerosis is only aimed at the cholesterol hypothesis. Because of the high concentration of plasma cholesterol, especially LDL cholesterol, is one of the main risk factors for atherosclerosis.[4-6]

The Government, in this case, the Ministry of Health of the Republic of Indonesia issued Law No. 381 of 2007 concerning National Traditional Medicines Policy. In one of the SKN (National Health System) subsystems, it is stated that the development and enhancement of traditional medicines is aimed at obtaining high-quality, safe, and real-world traditional medicines that are scientifically tested. Thus traditional medicines can be widely useful, both for self-treatment by the community and used in formal health services. The use of traditional medicine in Indonesia is part of the national culture and has been widely used by people since centuries ago. However, in general, their effectiveness and safety have not been supported by adequate research.[7]

Perseaamericana Mill (avocado) is one of the natural ingredients that contain several active ingredients which are thought to reduce cholesterol levels in the blood,

including: pantethin, niacin (vitamin B3), beta sitosterol, vitamin C, vitamin E, vitamin A (beta carotene), pantothenic acid, oleic acid, MUFA, folic acid, selenium, amino acids and fiber.[8]

Based on the description above, researchers are interested in researching the relationship of avocados to factors that influence inflammatory parameters, in this case LDL cholesterol, as a preventive measure of atherosclerosis risk. Therefore this study will examine the relationship of avocados made in the preparation of juice with LDL cholesterol.

Materials and Methods

This study used a pre and post test only control group design research method to determine the effect of avocado juice on LDL cholesterol in humans.

After obtaining approval from the Health Research Ethics Committee of the Faculty of Medicine, University of North Sumatra, samples of research subjects were collected.

Inclusion criteria: Study subjects were both men and women aged> 18 years, have complete personal data and willing in writing to take part in this research and sign the consent form after getting an explanation of this research (informed consent). Exclusion criteria : Suffering from kidney dysfunction, is known by examining blood creatinine levels (impaired renal function if serum creatinine levels> 2x upper limit is normal or Creatinine Clearance Test / CCT <30 ml / minute), disorders of digestive function in the form of avocado intolerance. Drop out criteria : If during the study period the subject dies or refuses to continue the research and if during the study the subject does not consume avocados that have been determined or suffer severe illness.

Research subjects who met the inclusion criteria, were given an information sheet and explained about the purpose of the study, the examination to be carried out, and the benefits of being a research subject. After that, his approval was asked to be the subject of the study, and signed the approval sheet as a research participant. Subjects underwent a pre-treatment period for one week (baseline period, starting from H-6 to day 0), with a diet like the subject's habits and asked not to consume avocados. On day 0, the patient underwent blood sampling for examination of LDL cholesterol. Subjects get an explanation of the dosage and how to drink avocado. The treatment starts at day 0, the subject consumes avocado in the daily juice as much as 1 cup per day. The consumption schedule is recommended while eating. On the last day of the treatment period, the 14th day, blood was taken for examination of LDL cholesterol.

To find out the data has a normal distribution or not analytically used Kolmogorov Smirnov test. If the distribution is normal, the mean and standard intersections are used. If the distribution is not normal, the median and range values (minimum - maximum) are used. To analyze the data between the two groups, an independent t test is used (if both data are normally distributed) or Mann-Whitney test (if one or both of the data is not normally distributed). Significant if $p \leq 0.05$.

Results

Characteristics of research subjects based on gender and age can be seen in the table below.

Table 1 Distribution of respondents by sex

Sex	Frequency	Percentage
Female	6	60
Male	4	40
Total	10	100

From the table above it can be seen that the most of the participant are female 6 people (60%)

Table 2 Distribution of respondents based on age range

Age	Frequency	Percentage
< 60	2	20
61 - 70	6	60
> 70	2	20
Total	10	100

From the table above it can be seen that the highest age range of respondents is between 61 - 70 years, which is 6 people (60%)

From the research that has been done regarding the effect of avocado juice on LDL cholesterol, the following results are obtained:

Table 3 LDL Cholesterol levels before and after avocado juice administration

LDL Cholesterol level	Mean	Min	Max	P
Before	137.5	93	193	0.003
After	112.5	67	154	

Furthermore, a statistical test was carried out on the initial LDL cholesterol level (pre test) and the final LDL cholesterol level (post test) showed that the mean value of the pre group was 137.5 mg / dl and post group = 112.5 mg / dl. The value of "P" for LDL cholesterol significance test is 0.003 (significantly different).

Discussion

Atherosclerosis is a response to the inflammatory complex - fibroproliferative to retention of lipoproteins - atherogenic lipoproteins in the intima of arteries. Originally, atherosclerosis comes from the Greek language, which is athere which means porridge and scleros are strong.[2]

Atherosclerosis is not the same as arteriosclerosis. Arteriosclerosis has a broad meaning, covering all diseases that can cause hardening of the arteries, such as atherosclerosis, back stenosis after angioplasty, and peripheral vascular disease. As previously known, the lesions of atherosclerosis, fatty streaks, have been found in the aorta during the fetal development period, especially in fetuses of mothers who have high cholesterol levels. This is what might underlie many of the events of myocardial infarction that occur in individuals without having ischemic symptoms first. Therefore, long-term efforts are needed to prevent this disease and the consequences of this disease are very dangerous.[2,4]

Atherosclerosis is the result of interaction gene - a complex environment. The gene factor itself can cause symptomatic atherosclerosis but is very rare. Most genetic background will cause an individual response to atherogenic gene factors and weakness of the vessel wall to atherogenic stimuli but environmental factors clearly influence the speed of disease progression (plaque development) and therefore will determine when coronary heart disease will occur.[9]

ATP-III classifies into 3 risk factor categories: High risk : Patients with coronary heart disease or patients with clinical manifestations of non-coronary atherosclerotic diseases such as peripheral artery disease, abdominal aortic aneurysms and carotid artery disease (such as transient ischemic attack or stroke or more than 50% blockage in the carotid artery), diabetes; Intermediate risk : Have two or more risk factors; Low risk : Have 0-1 risk factor.[10]

Epidemiological studies have shown that serum levels of LDL cholesterol are associated with the risk of atherosclerosis. This relationship has been observed in many populations around the world. Because serum LDL cholesterol levels are associated with LDL cholesterol levels in the population, the relationship between atherosclerosis and elevated serum LDL cholesterol levels will also be the same. The risk for atherosclerosis increases with an increase in LDL cholesterol concentration.[9]

The initial occurrence of atherosclerosis is the change of LDL into an oxidized form (OxLDL) by several factors such as radicals, lipoxygenation, which causes the breakdown of unsaturated fatty acids into LDL particles. OxLDL will increase the expression of pro-inflammatory enzymes, causing monocyte entry into the vessel wall and dysfunction of vascular endothelial cells. OxLDL will transform macrophages into foam cells which are atherosclerotic plaques.[11]

Based on table 3 above it can be seen that there was a decrease in LDL cholesterol levels in the group given avocado juice at 25 mg / dl. This very meaningful decline is very good because as described earlier that the risk for atherosclerosis is directly proportional to LDL cholesterol levels, which means that the lower the LDL cholesterol level of a person, the lower the risk for atherosclerosis.

The decrease in LDL cholesterol levels in the group given avocado juice may be due to the content of compounds in avocado, such as omega-9 oleic acid. Avocados are one of the natural ingredients that can help increase HDL levels, reduce total cholesterol levels and also reduce LDL levels. Where these conditions are thought to be caused by the content of active ingredients in avocados such as omega-9 oleic acid, panthetin, niacin (vitamin B3), beta setosterone, vitamin C, vitamin E, vitamin A, pantothenic acid, MUFA, folic acid, selenium, acid amino and fiber.[12]

Decreased LDL cholesterol levels provide clues about the possible influence of avocado meat which contains omega-9 oleic acid on structural functions, namely on the cell membrane as a signal of transduction and regulating function, namely maintaining membrane moisture so as to maintain the function of existing LDL receptors on the cell membrane. This can speed up the cycle of taking cholesterol. Furthermore LDL cholesterol from the circulation gets more into the liver cells and LDL cholesterol in the circulation goes down.[13]

Beta sitosterol (which is a derivative of phytosterol) is a content of PerseaAmericana Mill. which can reduce blood cholesterol levels by inhibiting cholesterol absorption and increasing excretion of cholesterol in the blood. The content of vitamin B3 (niacin) can reduce the production of VLDL, so that the levels of IDL and LDL decrease, which will reduce the total serum cholesterol level. Vitamin C has the effect of helping the hydroxylation reaction in the formation of bile acids so as to increase cholesterol excretion and reduce total cholesterol levels in the blood.[14]

The mineral content of selenium at Perseaamericana Mill can also reduce cholesterol levels. Selenium binds to plasma proteins to form selenoprotein complexes which are antioxidants. This complex serves to prevent LDL oxidation. In addition there are also vitamin A (beta caroten), vitamin E, and vitamin C in avocados as antioxidants. A diet high in avocados that is rich in monounsaturated fatty acids effectively lowers Low Density Lipoprotein and Appolippoprotein B compared to high-complex carbohydrate diets.[15]

Conclusion

Avocado juice with a level of 1 cup a day could decrease the LDL cholesterol serum level significantly and has a protective effect on the risk of atherosclerosis

Conflicts of Interest: None

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