The Effect of Giving Okra (Abelmoschus esculentus L.) Juice on HDL Levels in the Blood Serum of Wistar Strain Rats Fed High-Fat Feed

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The Effect of Giving Okra (Abelmoschus esculentus L.) Juice on HDL Levels in the Blood Serum of Wistar Strain Rats Fed High-Fat Feed

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Abstract. Cardiovascular disease is the biggest cause of death in the world with the number of deaths reaching 17.7 million people (31% of the total number of deaths). The main cause of cardiovascular disease is a disturbance in the function of the heart and blood vessels caused by atherosclerosis due to the deposition of cholesterol in artery walls. High Density Lipoprotein (HDL) functions to transport free cholesterol contained in the endothelial peripheral tissue to HDL receptors located in the liver so that it can be processed to be used as bile. Therapy to increase levels of HDL in the blood using okra juice (Abelmoschus esculentus L.) can be done in rats that have been given high-fat feed. The purpose of this study was to determine the effect of okra juice (Abelmoschus esculentus L.) on HDL levels in rats fed high fat. The study was conducted with giving okra juice (Abelmoschus esculentus L) with dosage difference of 1500 mg/kg bw, 3000 mg/kg bw and 6000 mg/kg bw. The research design used was complete random design with post-test randomized group design with a number of replications 5. Testing of HDL levels was carried out by the CHOD-PAP (Cholesterol Oxidase Para Aminophenazone) method. The research data were analyzed using one-way Anova followed by LSD tests. The results of the study giving okra juice (Abelmoschus esculentus L.) to HDL levels by induction of high-fat feed at a dose of 6000 mg / kg body weight were significantly different from lower dosage. Conclusion, okra juice (Abelmoscus esculentus L.) has a positive effect on increasing HDL levels..

1. Introduction

Cardiovascular disease is one of the non-communicable diseases with the highest mortality rates in the world with total deaths globally by 17.7 million people (31% of total deaths) [1]. Cardiovascular disease is a disease caused by impaired heart and blood vessel function such as coronary heart disease, heart failure, hypertension and stroke. The main cause of cardiovascular disease is atherosclerosis, a progressive multifunctional disease of the arterial wall. The central pathogenesis of atherosclerosis is cholesterol deposits in arterial walls [2]. Factors that can cause cardiovascular disease are unhealthy lifestyles such as irregular exercise, smoking, alcohol consumption and unhealthy diets. Unhealthy diets such as consumption of fast food can cause various diseases due to the tendency of consuming foods that are high in carbohydrates and saturated fats [3]. Foods high in carbohydrates and saturated fats can increase intracellular cholesterol, and cholesterol is stored as cholesterol esters. High-cholesterol diet can also lead to a decrease in the LDL receptor gene transcription so synthesis LDL receptor, and LDL level in the circulation increases [4].

LDL levels continue to increase can suppress HDL and cannot get rid of excess cholesterol in the blood so that HDL levels decrease [5]. Decrease in cholesterol levels in the blood can be influenced by changes in a healthier lifestyle, one of which is by changing diet by consuming fruits and vegetables. One of the fruits or vegetables that can reduce cholesterol levels in the blood is okra (Abelmoschus esculentus L). Okra (Abelmoschus esculentus L) is a plant from the malvaceae with a life cycle length of 90-100 days [6]. Okra plants (Abelmoschus esculentus L) are widely cultivated in the tropics, subtropics and regions with warm temperatures that exist throughout the world [7] with India as the country with the highest production of okra (Abelmoschus esculentus L). Okra is widely used as an ethnic treatment [8]. Okra (Abelmoschus esculentus L) is reported to have antioxidant activity in the form of quercetin and phenolic flavonoids [9]. Used cooking oil contains many free radicals due to lipid peroxidation [10]. Repeated use of cooking oil can cause damage to body organs such as blood vessels, heart, liver and kidneys due to the accumulation of fat (cholesterol) [11]. Used cooking oil has undergone chemical and physical changes. Chemical changes in the form of hydrolysis, oxidation and polimeration processes. While physical changes are marked by an increase in oil viscosity, a change in color and foam formation during frying [12]. The purpose of this study was to determine the effect of okra juice on HDL levels in rats fed high fat.

2. Method

The rats used were 25 male Wistar strain aged 2-3 months with a body weight between 150200g. Rats were grouped into 5 treatment groups with a number of replications 5. Experimental research was carried out with a completely randomized design method with Post-test Randomized group design. Producing Used cooking oil Used cooking oil is made using packaged cooking oil. Frying is done with frying tofu (250 g) for every 1 liter of oil with 4 repetitions [13] Producing Okra Juice Okra used in this research is green okra with species of Abelmoschus esculentus L. Moench which is still young with fruit size between 7-12 cm. Okra that has been washed clean, weighed at 150 grams and then cut into small pieces using a knife then added with 150 ml of water and blended until smooth then put in a bottle to be stored in the refrigerator with a temperature of -4oC.

Treatment The treatment was done for 7 days with induction cooking oil as high-fat feed as much as 1.5ml. The treatment was followed by induction of okra juice at each dose of each group. Group 1 (positive control) was given treatment in the form of standard feeding and drinking. Group 2 (negative control) was given treatment in the form of high-fat feed feeding and drinking. Groups 3-5 (T1, T2 & T3) were given high-fat feed and okra juice with doses of 1500 mg/kgBW, 3000 mg/kg BW and 6000 mg/kg BW respectively. On day 8th rat blood drawn through plexus retro orbitalus as much as 1.5 ml. HDL levels in rat blood serum were tested using the CHOD-PAP (Cholesterol Oxidase Para Aminophenazone) method. The data obtained were analyzed using the Shapiro-Wilk test for the normality test followed by the One-way Anova test and the LSD Test..

3. Results and Discussion

The process of atherosclerosis begins with an increase in cholesterol levels, causing LDL levels to rise and HDL to fall. Increased LDL triggers LDL oxidation and causes inflammation of blood vessel walls. The results of the study giving okra juice to rats fed high-fat feed are presented in Table 1.

Table 1. Summary of LSD follow-up test results on the effect of HDL levels in rats fed high fat feed

Groups	Mean
C -	91 a
C +	78 a b
T1	69 a b
T2	87,4 a b

Groups	Mean
T3	68 b

Note:
C- is a negative control
C+ is a positive control
T1 is a treatment with induction of okra juice with a dose of 1500 mg / kg BW
P2 is a treatment with induction of okra juice at a dose of 3000 mg / kg BW
T3 is a treatment with a dose of 6000mg / kg BW.

The 5% LSD test results showed that the response of HDL levels in the T3 group was significantly different when compared to the positive control but not significantly different from the negative control, the T1 and T2 treatment groups. This happens because the dose of okra juice is too low (1500 and 3000 mg/kg body weight /day) so that okra juice cannot bind all cholesterol and fat in the intestine.

In the study that has been done, it was shown that the value of HDL levels in rat blood serum was 69.6, 87.4 and 68 mg/dL for the treatment groups respectively 1500, 3000 and 6000 mg/kg BW/day respectively compared to 78 mg/dL for negative control and 91 mg/dL for positive control. Induction of used cooking oil that acts as a high-fat feed for 7 days shows the HDL levels in the blood with the highest average. This result is inversely proportional to the treatment given okra juice with a dose of 6000 mg/kg BW/day as the highest dose which has the lowest average HDL levels of all treatments. [14] mentioned a significant increase in HDL levels in diabetic rats after being given okra juice. Muchilage produced by okra is also beneficial for reducing the level of hyperglycemia and decreasing dyslipidemia in streptozotocin-induced diabetic rats [15]. The secondary metabolite compounds found in okra (*Abelmoschus esculentus* L) include alkaloids, glycosides, tannins, steroids/terpenoids and flavonoids [16]. Alkaloid compounds can inhibit the performance of the lipase enzyme in the digestive tract so that fat absorption in the body is reduced [17]. Terpenoid compounds play a role in inhibiting cholesterol biosynthesis by regulating the degradation of the enzyme 3-hydroxy-3-methylglutaril (HMG-CoA) reductase [18]. [19] stated that the skin of okra fruit and okra seed powder (*Abelmoschus esculentus* L) have potential as anti-hyperlipidemic in diabetic rats. Further research has identified the presence of two major flavonoids of glucoside (isoquercetin and quercetin 3-O-betaglucopyranosyl-(1-6) glucoside) in okra seeds (*Abelmochus esculentus* L) showing inhibitory activity of α-glucosidase which is responsible for decreasing blood sugar levels in rat. Quercetin works in decreasing free radicals by transferring an electron to free radical compounds and forming complexes with metals and increasing the activity of antioxidant enzymes such as SOD, CAT and GSH-Px. Quercetin can work as a strong scavenger because it has an aromatic hydroxy group [20]. Quercetin can reduce de novo synthesis in fatty acids thereby affecting cholesterol biosynthesis and lipoprotein formation [21]. Fiber in the okra can affect hypolipidemic, stabilized blood sugar levels by determining the absorption of blood sugar levels by the intestine and decreasing sugar assimilation through the intestine [22].

4. Conclusion

The administration of okra (Abelmoschus esculentus L) juice to Wistar strain rats fed with high-fat feed influences HDL levels in blood serum at a dose of 6000 mg / kg BW.

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