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THE EFFECT OF RED DRAGON FRUIT (HYLOCEREUS POLYRHIZUS) JUICE ON TOTAL CHOLESTEROL LEVEL IN WOMEN

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Abstract

Cholesterol is a component of fat/lipid substances in the form of free and esters with fatty acids. The excessive cholesterol in the blood can form deposits on the walls of blood vessels, causing atherosclerosis. Anthocyanins and tocotrienol compounds in red dragon fruit can suppress the formation of cholesterol in the body. The type of research used was an experiment with a pretest and posttest approach. The study used 1 dose of 2.86g/KgBW for 14 days. The samples used were the women members of PKK RT 04 RW 16 Mojosongo Surakarta totaling 18 people. The average total cholesterol level before treatment in this study was 237.28 mg/dl and after treatment 222.89 mg/dl. This study was tested using the Shapiro-Wilk test. It was known that the data were normally distributed ($p > 0.05$), Paired t-test data obtained a significance result of 0.012 ($p < 0.05$). It can be concluded that H_0 is rejected, which means that there is an effect of giving red dragon fruit juice (Hylocereus polyrhizus) on total cholesterol levels in women.

Keywords: Total cholesterol; Dragon fruit; Anthocyanins; Tocotrienols; Women

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INTRODUCTION

Cholesterol is one of the components of fat/lipid substances that are in free form and esters with fatty acids, and is the main component of brain and nerve cell membranes. Eighty percent of cholesterol is produced from within the body (formation by the liver) and the remaining twenty percent from outside the body (food consumed) (Sigarlaki & Tjiptaningrum, 2016; Fauziah & Karim, 2020).

Cholesterol is an essential structural component of all cell membranes and a major component of brain and nerve cells. High concentrations or levels of cholesterol are found in glandular tissue and in the liver where cholesterol is synthesized and stored. Cholesterol also plays a role in the formation of bile acids, folic acid, and adrenal cortex hormones, estrogens, androgens, and progesterone. Cholesterol in the body can be obtained from synthesis in the liver with the main ingredients of carbohydrates, proteins, and fats (Almatsier, 2009; Departemen Gizi dan Kesehatan Masyarakat UI, 2010).

According to the National Health Center Statistics (NCHS) in 2015-2018, the prevalence of high cholesterol in men was 10.5% and in women was 12.1%. The highest proportion of total cholesterol

levels was found in the female sex. Based on the results of the Pradono & Werdhasari (2018), it indicates that the population in Indonesia with the age of > 15 years, namely high total cholesterol was high by 35.9 percent. When viewed by gender, the proportion of high cholesterol levels in women was higher than men.

Hypercholesterolemia that occurs in women aged 30-49 years can be caused by poor dietary patterns such as high cholesterol intake and low fiber intake. Women of this age are classified as women of childbearing age because the hormone estrogen still functions well as a cardio protective or prevents the formation of plaque in the arteries by increasing levels of High Density Lipoprotein (HDL) cholesterol and lowering Low Density Lipoprotein (LDL) cholesterol levels, and has a strong antioxidant effect on total cholesterol (Sarjana & Fitranti, 2014).

Indonesia is a country known for its natural resources such as fruits that can be used to prevent various diseases. People have been using natural ingredients as an alternative to disease treatment since ancient times, but many natural ingredients have been packaged in a modern way because of technological advances. However nowadays, people are more familiar with chemical drugs because

they are easy to get at the nearest shops and stalls (Yassir & Asnah, 2017).

Dragon fruit is included in the fruit that is quite easy to get in traditional markets or at the nearest supermarket. The compounds contained in dragon fruit are alkaloids, phenolics, flavonoids, steroids and terpenoids, where the levels of flavonoids and terpenoids are slightly higher (Laurensia, 2015).

Compounds in dragon fruit that can affect cholesterol levels are anthocyanins and tocotrienols. The tocotrienol compounds found in dragon fruit can also inhibit the HMG-CoA reductase enzyme which controls the cholesterol biosynthesis pathway in the liver, inhibiting the formation of mevalonate so that cholesterol formation will decrease. The fiber content can also play a role in lowering cholesterol levels in the body, fiber can delay gastric emptying so that the feeling of fullness becomes longer which results in reduced calorie intake from food. Fiber can also bind bile acids so that they will be secreted through the feces causing a decrease in the amount of bile salts that go to the liver. This decrease results in an increase in the uptake of cholesterol from the blood to be resynthesized into new bile salts, resulting in a decrease in total cholesterol levels in the blood. VLDL will not be hydrolyzed and LDL will be

suppressed if cholesterol formation can be inhibited (Budiatmaja & Noer, 2014).

Anthocyanin compounds are included in the flavonoid sub-type and tocotrienol compounds are included in terpenoid compounds. Anthocyanin levels in red dragon fruit are higher than white dragon fruit because anthocyanins are polyphenol compounds that are rich in pigments that form red, purple, and blue colors in fruits or vegetables. Anthocyanin levels range from 8.8 mg/100gram dragon fruit. However, this compound has unstable properties and is easily degraded. The stability of these compounds is influenced by pH, storage temperature, light, enzymes, oxygenation, structural differences in anthocyanins, and concentrations of anthocyanins (Sigarlaki & Tjiptaningrum, 2016).

Based on the description above, the researchers were interested in conducting research with the title "The Effect of Giving Red Dragon Fruit Juice (*Hylocereus polyrhizus*) on Total Cholesterol Levels in Women".

MATERIALS AND METHODS

This study used an experimental analytical research type with a Pretest and Posttest one group design approach to determine the effect of giving red dragon fruit juice (*Hylocereus polyrhizus*). This study was carried out starting from the preparation of the proposal to the final

preparation, namely in September 2021 to June 2022. The independent variable in this study was the administration of red dragon fruit juice at a dose of 2.86g/KgBB with the addition of 80ml of water for 14 days and the dependent variable is a woman's total cholesterol level. The implementation of this research has received approval from the Ethics Committee of the Faculty of Medicine, University of Muhammadiyah Purwokerto through the publication of Ethical Clearance.

The subjects of this study were members of the PKK RT 04 RW 16, Mojosongo, Surakarta. The inclusion criteria in this study were women of childbearing age (30-49 years). The subjects were not taking cholesterol-lowering drugs or antihyperlipidemic drugs in the last 1 month, do not consume alcohol, and were not sick or under medical care related to coronary heart disease, diabetes mellitus, hypertension, kidney failure, and other chronic diseases, and willing to be a research subject as evidenced by informed consent. Measurement of cholesterol levels using the POCT (Point Care of Testing) method. Determination of the subject using Total Sampling. Meanwhile, data on Body Mass Index (BMI) and waist circumference were collected using research questionnaires.

Measurement of the nutritional status of subjects with BMI was calculated by the formula.

$$BMI = \frac{\text{Berat Badan (Kg)}}{\text{Tinggi Badan (m)}^2}$$

After that, the calculation was categorized according to *cut off point* as follows:

Table 1. Body Mass Index Category

BMI	Category
<17.0 – 18.4	Thin
18.5 – 25.0	Normal
25.1 - >27.0	Fat

Waist circumference was measured using a tape measure and the results were grouped into 2 groups as follows:

Table 2. Obesity Categories by Waist Circumference

Waist size (cm)	Category
<80	Non-Central Obesity
>80	Central Obesity

Data on total cholesterol levels were analyzed using the IBM SPSS version 22 application with *Shapiro-wilk* normality test followed by *Paired sample t-test* use level of confidence 95% or (= 0.05%).

RESULTS AND DISCUSSION

This study was conducted in the Family Welfare Empowerment (PKK) group in RT 04 RW 16, Mojosongo, Jebres, Surakarta. The sample of this study was 18 people who were members of PKK RT 04 RW 16.

Table 3. Data Characteristics

Characteristics	Category	Frequency (Person)
Cholesterol Levels After Treatment	Decrease	12
	Enhancement	6
	Amount	18
BMI	Thin	0
	Normal	12
	Fat	6
	Amount	18
Waist size	Non-Central Obesity	5
	Central Obesity	13
	Amount	18

Table 3 above is data on cholesterol levels of 18 respondents who had cholesterol levels checked before and after being given treatment with red dragon fruit juice (*Hylocereus polyrhizus*) for 14 days. Increased total cholesterol levels can be caused by several factors such as poor diet and stress and lack of physical activity or exercise. Based on Zuhroiyyah *et al.*, (2017) if we do not do physical activity, the body will not make energy in the form of Adenosine Tri Phosphate (*ATP*) from the food consumed. Hence the food consumed a lot is formed into cholesterol, as a result total cholesterol levels in the body increase. Based on Suarsih (2020) there is a relationship between diet and blood cholesterol levels, which is caused by an unbalanced diet. Based on the results of the Eating Behavior Survey, female respondents consume more fat along with animal fat. The more fatty foods you eat, the higher your blood cholesterol levels. Based on Thrifty *et al.*, (2020) stress can not only change a person's psychological state, but can also change the person's metabolic processes. These metabolic changes are influenced by changes in the hormones cortisol and epinephrine, which increase during stress, and the effects of cortisol and epinephrine on mobilizing blood fat and fatty acid stores. According to the Ivanna (2018) this age can start in your mid-30s or as late as your mid-50s. The term perimenopause only describes the time when the menstrual cycle can no longer be predicted or it can be said that perimenopause is a transition period before menopause. During perimenopause, levels of estrogen, the main female hormone, begin to decline. The mechanism for this period of perimenopause is that the ovaries begin to produce less estrogen as get old in preparation for stopping releasing eggs. When the hormone estrogen decreases, this hormone throws off the balance with progesterone. These two hormones were responsible for ovulation and menstruation. One of the criteria used in

this study was the age of 30-49 years which is included in the age of perimenopause.

Table 4. Minimum Value, Maximum Value, Average Value, and Cholesterol Level Value Before and After Treatment

	Min (mg/dl)	Max (mg/dl)	Average	Decrease Percentage
Before Treatment	199	270	237.3	6.1%
After Treatment	162	265	222.9	

Table 4 indicates the average cholesterol levels using POCT is to use biosensor level before treatment was 237.28 mg/dl technology that generates electric charges and after treatment had an average of by chemical interactions between certain 222.89 mg/dl. The percentage decrease in substances in the blood and dry chemicals in cholesterol levels before and after treatment reagents (strips) and will be measured and was 6.1%. Based on Kristanto (2014) dragon then converted into the appropriate fruit has 4 types, namely white flesh dragon number. with the amount of electric charge. fruit, purplish red flesh dragon fruit, super The amount of electrical charge produced is red flesh dragon fruit, and white yellow flesh considered to be equal to the measured level dragon fruit. In this study, dragon fruit with of the substance in the blood. The advantage purplish red flesh was used since this fruit of this POCT method is that the results of the was classified as a type that is very diligent diagnosis can be established quickly, easy to in flowering, even tends to flower use, and can be carried around. However, throughout the year. The average weight of POCT also has drawbacks, namely the 1 fruit is about 400 grams. precision and accuracy of this tool is not

According to Nursidika *et al.*, (2018), the good when compared to the gold standard mechanism for measuring total cholesterol method, namely using a chemical analyzer.

Table 5. Shapiro-Wilk . Data Normality Test

Variable	Shapiro-Wilk Significance value
Levels Before Treatment	0.633
Levels After Treatment	0.479

In table 5 Cholesterol levels in this value showed 0.479. Both data have a study were tested using Shapiro-wilk significance value > 0.05, so it can be where in the group before treatment the concluded that the data were normally significance value showed 0.633 and in the distributed. Then proceed with the Paired group after treatment the significance Sample t-test (paired t-test).

Table 6. Paired t-test

Cholesterol Level	<i>Paired sample t-test</i>
	Significance value
Before Treatment After Treatment	0.021

In table 6 the results of cholesterol levels before and after treatment with red dragon fruit juice (*Hylocereus polyrhizus*) obtained a significance value = 0.021 from the results of the significance it can be concluded that there was a significant effect between cholesterol levels before and after administration of red dragon fruit juice (*Hylocereus polyrhizus*) . Based on Budiatmaja & Noer (2014) it decreased total cholesterol level can occurred due to the presence of antioxidants, triterpenoids, alkaloids, fiber, and unsaturated fatty acids. Tocotrienol compounds work by inhibiting the HMG-CoA reductase enzyme which controls the cholesterol biosynthesis pathway in the liver and inhibits the formation of mevalonate so that cholesterol formation can be suppressed. Compounds that also play a role in reducing cholesterol levels are anthocyanins. This compound was a compound that gives dragon fruit its red color pigment. This compound works by inhibiting the work of Cholesterol Ester Transfer Protein (CETP) so that the formation of cholesterol decreases (Sigarlaki & Tjiptaningrum, 2016). Based on Prakoso *et al.*, (2017) the fiber

contained in red dragon fruit was 3.2g/100g. In the digestive tract, This fiber bound to bile acids (the end product of cholesterol) and was excreted in the feces to lower total cholesterol levels. Dietary fiber can lower cholesterol levels in the body.

CONCLUSION

Based on research that has been carried out on members of PKK RT 04 RW 16 Mojosongo, Surakarta, totaling 18 people, it can be concluded that there is an effect of giving red dragon fruit juice (*Hylocereus polyrhizus*) as much as 2.86 g/KgBB proven to reduce total blood cholesterol levels in women by inhibiting the mechanism of action HMG-CoA reductase enzyme so that cholesterol levels can decrease with a percentage decrease of 6.1%.

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