THE EFFECT OF DIET AND PHYSICAL ACTIVITY ON TOTAL CHOLESTEROL LEVELS

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Abstract: The purpose of this study was to determine the effect of diet and physical activity on total cholesterol levels. The method used is a descriptive method with survey techniques. The population of study program coordinators within UNJ and the sampling technique with random sampling is that all populations have the same opportunity to be sampled. The result of this study is that the frequency (X1) to cholesterol (Y) has a correlation of -0.434 meaning that there is a negative correlation between the frequency of exercise and cholesterol and significant because the significant number is 0.027 below 0.05. This means that the more often you exercise, the lower your cholesterol. While diet (X2) to cholesterol (Y) has a correlation of -0.418 there is a negative correlation between diet and the amount of cholesterol and significant because the significant number is 0.034 below 0.05. This means that by managing a good diet, the cholesterol is getting lower. So the conclusion is that the more often you exercise, the lower the cholesterol, and the better you regulate your diet, the lower the cholesterol.

Keywords: diet, physical activity, total cholesterol.

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INTRODUCTION

Lifestyle changes, from a *traditional lifestyle* to a *sedentary lifestyle* increase the risk of overweight. A sedentary lifestyle (lack of movement) is accompanied by an excessive diet, namely a high intake of carbohydrates, fat, protein, and fiber (Proverawati, 2010). An unhealthy lifestyle will cause health problems. Although it does not have an immediate impact, this impact will be seen in the long term. Maybe when you start to get older, you can feel the effects of a sedentary lifestyle and a bad diet.

The prevalence of hypercholesterolemia in Indonesia according to the 2004 Household Health Survey (SKRT) in the age group of 25-34 years is 9.3% and increases with the increase in age in the age group of 53-64 years by 15.5%. The prevalence of hypercholesterolemia in Indonesia is 1.5% in men and 2.2 in women. The results of Riskesdas in 2013 showed that the proportion of the Indonesian population with cholesterol levels above normal was higher in women, which was 39.6% compared to men by 30%. Some of the factors that influence total cholesterol levels are a high-fiber diet, a high-fat diet, smoking habits, gender, obesity, and physical activity. Eating behavior is the cause of obesity problems. Three things are emphasized in a person's eating behavior, namely eating control, emotions and hunger. Wrong eating behavior is the act of consuming excessive amounts of food without being balanced with balanced energy expenditure, one of which is with physical activity, namely exercise (Annies, 2015) (Morimoto et al., 2002) (Sudargo et al., 2018).

Physical activity carried out must be in accordance with the goals to be achieved, namely to maintain physical fitness while still guided by the principles of exercise such as frequency, intensity, tempo, time and volume and progressive or increasing. To get results from maximum physical activity is recommended with the BBTT principle, which is good, correct, measurable and regular. Good is to do physical activity according to its ability, true is an activity that is carried out gradually and ends with cooling or stretching, measurable is a physical activity that is measured in intensity and also time, and the last is a physical activity that is done regularly as much as 3-5 times a week. (Kemkes.go.id, 2018) .

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If physical activity such as exercise can be a benchmark for maintaining physical fitness, it can also be used as an activity to burn the body's cholesterol. Cholesterol comes from the food we consume daily. Be it from rice (triglycerides), from animal protein (meat) or from oil When frying food. It is these fats that will not break down or burn into energy if humans move less. Exercise done to be able to burn fat must be above 30 minutes because the first 30 minutes that are used as energy are from carbohydrates. Therefore, it is necessary to regulate diet and activity patterns in order to control the body's total cholesterol.

High levels of cholesterol in the blood is one of the risk factors for various kinds of non-infectious diseases such as heart, stroke and diabetes mellitus. Based on the results of research that have been done, the risk of asterosclerosis which is the cause of CHD will increase if total cholesterol levels in the blood exceed normal limits. Excess cholesterol levels in the blood will easily attach to the inner wall of blood vessels. Excess LDL through the oxidation process will form larger clots will form lumps that will result in narrowing of blood vessel channels. This process is usually called atherosclerosis (Annies, 2015).

Diet is a way or effort to regulate the amount and type of food with a picture of information including maintaining health, nutritional status, and preventing or helping cure disease. (Drepkes RI, 2019). According to, eating patterns are characteristic of activities that repeatedly eat an individual or each person eats in meeting food needs. (Sulistyaningsih, 2011) .

A good diet contains food sources of energy, sources of building substances, and sources of regulatory substances, because all nutrients are necessary for the growth and maintenance of the body as well as brain development and work productivity, and are eaten in sufficient quantities as needed. With a balanced and safe daily diet, it is useful to achieve and maintain optimal nutritional status and health.

Components and Dimensions of Diet

According to, diet consists of three components, namely; type, frequency and amount of food. (Sulistyaningsih, 2011).

1. Types of feeding. This type of feeding is a kind of staple food eaten every day consisting of staple foods, animal side dishes, vegetable side dishes,

vegetables, and fruits consumed every day. The staple food is the main food source in Indonesia consumed by every person or group of people consisting of rice, corn, sago, tubers, and flour.

2. Feeding frequency. The frequency of eating is several meals a day including breakfast, lunch, dinner, and interlude meals.

3. The number of feedings. The number of meals is the amount of food eaten by each person or each individual in the group.

According to there are three dimensions of eating patterns in a person, which are as follows: (Elfhag & Morey, 2008)

1. External eating, is responding to stimuli related to food (in terms of smell, taste, and appearance of food) without the internal state of hunger and fullness.

2. Emotional eating, refers to eating in terms of responding to negative emotions (such as fear, anxiety, anger, and so on) in order to relieve stress while ignoring the internal physiological signals of hunger.

3. Restrained eating, is the level of conscious or cognitive restriction of food (trying to refrain from eating in order to lose or maintain a certain weight).

Healthy Diet Settings

According to, there are three groups of healthy food ingredients based on their functions, namely: (Sunita Almatsier, 2009).

1. Source of energy/energy, serves for work, study, and others. Food sources of energy are grains, flour, sago, bananas, and so on.

2. Source of building substances, serves for growth and replacing damaged body tissues. Food sources of substances that build fish, chicken, eggs, meat, milk, nuts, and processed products, such as tempeh, tofu, and oncom.

3. Source of regulatory substances, serves to protect the body from disease. Food sources of regulatory substances are all types of vegetables and fruits, which contain a variety of vitamins and minerals.

While according to a healthy diet are as follows: (Irianto D.P, 2007).

1. Enough quantity. That is, the amount of food eaten by each person depends on the weight, gender, age and type of activity of the person. For example, sports students certainly need more food intake than ordinary students.

2. Proportional. The amount of food consumed is in accordance with the proportion of balanced healthy foods, namely carbohydrates 60%, fat 25%, protein 15%, and sufficient needs of vitamins, water and minerals.

3. Enough quality. It is necessary to take into account the quality of food, such as its proportional content, taste and appearance.

4. Healthy and Hygienic. Food should be sterile or free of disease germs. One effort to sterilize the food is to wash it thoroughly and cook it to a certain temperature before consumption.

5. Fresh food and not supplements. Fresh vegetables and fruits are healthier than factory food, junk food, or fast food.

6. How to cook do not overdo it. For example, vegetables that are boiled for too long at high temperatures actually cause a loss of vitamins and minerals in these vegetables.

7. Regular in serving. The presentation of feeding remains regular every day. Do not get used to eating when you remember because it can cause digestive disorders, such as heartburn or bowel movements that are not smooth.

8. Frequency five times a day. For example, three main meals (morning, noon, and dinner) and two interlude meals. Remember, the food consumed is still adjusted to the capacity of the stomach.

9. Drink six glasses of water a day. The body requires 2,550-liters of water per day. The water needs are obtained from food as much as 100 ml, metabolic waste as much as 350 ml and from drinking water as much as 1,200 liters (6 cups). For this reason, it is recommended to drink as much water as a glass of water equivalent to 1,200 liters.

Factors Affecting Diet

According to, the factors that influence diet are as follows: (Ministry of Health, 2007).

a. Culture

Culture simply determines the type of food that is often consumed. Similarly, geographical location affects the food he wants. For example, rice for Asians and Orientalists, pasta for Italians, and curry for Indians are staples. Seafood is much loved by people along the coast of North America. While the population of Southern America prefers fried foods.

b. Religion/Belief

Religion/belief also affects the type of food consumed. For example, Islam and Orthodox Judaism forbid pork. Roman Catholicism forbids eating meat every day, and some religious denominations (Protestants) such as Advent forbid adherents from consuming tea, coffee or alcohol.

c. Socioeconomic Status

A person's choice of food type and quality is also influenced by social and economic status. For example, the lower middle class or poor people in the village cannot afford expensive ready-made food, meat, fruit and vegetables. Income will limit a person from consuming expensive foods.

d. Personal Preference

Things that are liked and disliked are very influential on a person's eating habits. People often start their eating habits from childhood to adulthood. For example, fathers don't like to eat kai, and neither do their sons. Mother does not like shellfish food, and neither does her daughter. A person's likes and dislikes of food depend on their association with that food.

e. Hunger, Appetite, and Satiety

Hunger is generally a less pleasant sensation because it is associated with lack of food. Conversely, appetite is a pleasant sensation in the form of a person's desire to eat. While satiety is a feeling of satisfaction because he has fulfilled his desire to eat. The central regulation and control of the mechanisms of hunger, appetite and satiety is carried out by the central nervous system, the hypothalamus.

f. Health

A person's health has a big influence on eating habits. Canker sores or sore teeth often make individuals choose soft foods. Not infrequently people who have difficulty swallowing, choose to endure hunger rather than eat.

Physical Activity

Physical activity is any body movement caused by the work of skeletal muscles and increases energy and energy expenditure. In general, physical activity is divided into 3, namely: (Kemkes.go.id, 2018).

1. Daily physical activity

The first type of activity is in your daily life. Daily activities in taking care of the house can help you to burn calories obtained from food consumed. Such as washing clothes, mopping, walking, cleaning windows, gardening, ironing, playing with children, and so on. Calories burned can be 50 – 200 kcal per activity.

2. Physical exercise

Physical exercise is an activity that is carried out in a structured and planned manner for example walking, *jogging*, *push ups*, stretching, aerobic gymnastics, cycling, and so on. Judging from its activities, physical exercise is often categorized with sports.

3. Sport

Sports are defined as structured and planned physical activity by following applicable rules with the aim not only to make the body fitter but also to get achievements. Which is included in sports such as football, badminton, basketball, swimming, and so on.

Physical activity carried out for 30 minutes every day will be beneficial , such as: (Kemkes.go.id, 2018)

1. Maintain health to avoid disease
2. Increase muscle strength and endurance
3. Burns calories and prevents overweight
4. Boosts self-confidence
5. Reduce stress and emotional
6. Makes sleep better
7. Make your face and body fresher

Meanwhile, physical activity based on intensity is divided into 3, namely:

1. Light physical activity

When performing light activities, you won't feel breathless or your heart beats faster than usual. The body will also not burn many calories into energy. These activities include:

- washing dishes,
- cook
- leisurely stroll in the shopping center,
- drive motor vehicles, fish, and
- domuscle stretching.

2. Moderate physical activity

This activity is characterized by a faster heart rate, shorter breaths, and increased body temperature. You may also feel a little tired after doing so. Examples of moderate activities include brisk walking, cycling, carrying children aged 2–6 years, climbing stairs, changing gallons of drinking water, yoga, dancing, playing volleyball, and skating on roller skates or *skateboards.*

3. Strenuous physical activity

For strenuous activity, your body burns more calories because the energy needed is quite large. You will also pant accordingly doing these activities. Usually, activities for adults that are quite heavy are sports such as: futsal, running, swimming, mountain climbing, jumping rope, and badminton. Strenuous physical activity can also be work that

requires energy such as hoeing, pedaling a rickshaw, or completing construction work.

Total Cholesterol

Total cholesterol levels in the blood greatly affect the formation of plaque on the walls of blood vessels. Cholesterol levels that exceed normal limits will trigger the process of atherosclerosis. Atherosclerosis is a clinical manifestation of Coronary Heart Disease. High levels of cholesterol in the blood is a serious problem because it is one of the risk factors for various non-communicable diseases such as heart disease, stroke, and diabetes mellitus. Based on studies that have been conducted, the risk of atherosclerosis which is the cause of CHD will increase if total cholesterol levels in the blood exceed normal limits (Annies, 2015b). (Yoeantafara &; Martini, 2017)

Excess cholesterol levels in the blood will be easily attached to the inner wall of blood vessels. Excess LDL through the oxidation process will form clots which if the clots get bigger will form lumps that will result in narrowing of blood vessel channels. This process is usually called atheroclerosis. (Annies, 2015).

Fiber consumption can help reduce the absorption of fat and cholesterol in the blood. Some studies show that a fiber diet by consuming foods high in peas, including kidney beans, can reduce cholesterol levels in the blood by up to 10% in patients with hypercholesterolemia. In addition, water-soluble fiber fermented in the large intestine will produce short-chain fatty acids that can deplete the synthesis of liver cholesterol. (Khomsan A., 2007).

METHOD

This study used a descriptive method with survey techniques. This study was conducted by measuring the effect of diet and physical activity on total cholesterol levels. The population in this study is the Study Program Coordinator within Jakarta State University. The sampling technique is by random *sampling* technique, where all populations have the opportunity to be used as research samples. Data collection techniques by distributing questionnaires to prospective samples online, the returned questionnaires will be used as research data. The collected data is then processed with two-path SPSS.

RESULT AND DISCUSSION

From the data that has been obtained, it can be seen the description of the data from the measurement results presented by looking at the average, median, minimum value, maximum value and standard deviation of each variable with also included sample characteristics in terms of age and body mass index as follows:

Table 1. Description of Research Data

No.	Size	Value				
		X_1	X_2	Y	Age	BMI
1	Average	2.7	2.8	181.2	52.12	26.15
2	Median	3	2.9	170	25.38	54.5
3	Minimum Value	1	1.5	80	36	20.31
4	Maksimum Value	4	3.5	270	65	39.66
5	St. Deviation	1.44	0.28	2185.7	45.95	14.09

Source: Data Processing Results

Table description:
X1 : sports activities
X2 : diet
Y : Total cholesterol

In table 1 above can be seen the average of sports activities which is 2.7 times per week, diet as much as 2.8 times per week and cholesterol of 181.2 mg / dl with sample characteristics with an average age of 52.12 years and body mass index of 26.15 kg / m2. To see the relationship or correlation of sports activities (X1) with cholesterol (Y) and diet (X2) with cholesterol (Y) can be seen in table 4.2 below

Table 2. Correlation between Sports Activities (X1) and Cholesterol (Y) and Diet (X2) and Cholesterol (Y)

Correlations		X1	X2	Y
X1	Pearson Correlation	1	.464[*]	-.434[*]
	Sig. (2-tailed)		.017	.027
	N	26	26	26
X2	Pearson Correlation	.464[*]	1	-.418[*]
	Sig. (2-tailed)	.017		.034
	N	26	26	26
Y	Pearson Correlation	-.434[*]	-.418[*]	1
	Sig. (2-tailed)	.027	.034	
	N	26	26	26

Source: Data Processing Results

In table 2 above, it can be seen that exercise activity (X1) to cholesterol (Y) has a correlation of (-0.434) which means there is a negative correlation between exercise activity (X1) and cholesterol (Y) and significant because the significant number (0.027) is below 0.05. This means that the more often you exercise, the lower your cholesterol . Diet (X2) To cholesterol (Y) The correlation is -0.418 there is a negative correlation between diet and the amount of cholesterol and is significant because the significant number (0.034) is below 0.05. This means that by managing a good diet, the cholesterol is getting lower.

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