THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND DIETARY PATTERNS WITH TOTAL CHOLESTEROL LEVELS IN OLDER ADULTS

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ABSTRACT

The level of total cholesterol in the blood that exceeds the normal limit can cause blockage of plaque, damage to the blood vessels, and trigger the occurrence of atherosclerosis. One way to do this is to maintain total cholesterol levels in the blood through physical activity and a healthy diet. The aim of this study was to find out the relationship between physical activity and the diet of the elderly for total cholesterol levels. The design used in this study is a descriptive analysis with a cross-sectional approach and a sample size of 37. The data analysis used in this study is a Chi-Square test. The results of the study obtained the number of respondents based on physical activity and dietary patterns, with high total cholesterol levels in as many as 12 elderlies and normal levels in as many as 25 elderlies. The study concluded that there was a relationship between physical activity such as exercise with p-value = 0.038 and sleep patterns with p-value = 0.027 for total cholesterol levels. Then, there was a relationship between the diet consumption of staple foods with p-value = 0.038 and based on IMT with p-value = 0.013 for total cholesterol levels, but there was no relation between the diet consumption of fried food with p-value = 0.394 and seafood consumption with p-value = 0.274 for total cholesterol levels.

Keywords*: Physical activity, Dietary habit, Levels of Total Cholesterol*

INTRODUCTION

Non Communicable Diseases (NCDs) have become the focus of health issues at the global and national levels and have become a strategic issue on the 2030 SDG agenda. Deaths from the increasing number of PTMs are the driving force behind global strategies for making agreements in prevention and control, especially in developing countries. According to the data of the World Health Organization (WHO, 2018) in (Ministry of Health, 2019), deaths by PTM include 35% due to heart disease and blood vessels, 12% due to cancer, 6% caused by chronic respiratory disease, 6% due to diabetes, and 15% due to other PTM (Ministry of Health, 2019).

One of these pathologies is cardiovascular disease. Cardiovascular disease is a consequence of coronary heart disease, one of the causes of which is

atherosclerosis *(Ghani et al*., 2016). Atherosclerosis is damage to the walls of the arteries that affects the two layers of the membrane, the intima and media. Atherosclerosis is associated with fat degeneration and the hardening of blood vessels. A person with high cholesterol levels has an increased risk of atherosclerosis, coronary artery disease, or carotid artery disease. Cholesterol can form a blockage in plaque and cause damage to blood vessels. When plaque builds up in the artery, it can harden and narrow the arterial lumen, reducing blood flow to the heart muscle and causing coronary artery disease (Maulida *et al*., 2018).

Results from Basic Health Research 2018 show that the incidence of cardiovascular disease in Indonesia is increasing every year; there are at least 2,784,064 people suffering from heart disease. The prevalence of coronary heart disease in the population of all ages based on the diagnosis of doctors was 1.5%, with the highest number of cases in Northern Kalimantan at 2.2% (Ministry of Health, 2018).

The occurrence of high-fat levels can be caused by consumption patterns of foods high in saturated fats or containing high cholesterol. In the behavior of consumption of fatty foods, high cholesterol, and fried foods with a frequency of $\geq$1 times per day, the Central Java province occupied the top position (60,3%). In the province of DKI Jakarta itself, the consumption of fatty foods once a day is 47.8% (Basic Research of Health 2013, 143–144).

In addition to food consumption, lipid profiles can also be influenced by body mass index (BMI). Body time index correlates with direct body fat measurements such as underwater weighing and dual-energy x-ray absorptiometry, and these measurement results are categorized to determine nutritional status values (Setyawati and Hartini, 2018).

Physical activity is another factor that can affect blood cholesterol, along with food. Exercise for 30 minutes regularly, 3-5 days a week, can lower LDL cholesterol levels to 10 mg/dL and increase HDL cholesterol levels to 4 mg/dL. A significant decrease in the overall cholesterol profile and LDL cholesterol levels followed by an increase in HDL cholesterol levels is known to have a positive effect on cardiovascular health (Mutmainnah *et al*., 2023).

A study conducted by Sofiatun showed that there was a relationship between fat intake, fiber intake, and nutritional status with blood cholesterol levels before and after old age, but there was no relationship between cholesterol intake and physical activity with pre-old age blood cholesterol levels.

Based on the above background, cardiovascular disease is still a major health problem and needs to know its causes, one of which is by increasing total cholesterol levels, so the researchers want to analyze the relationship between physical activity (exercise and sleep duration) and diet (consumption of raw foods, strawberries, seafood, and BMI) and total cholesterol levels. This study aims to find out if there is a link between physical activity and the dietary patterns of the elderly against total cholesterol levels.

METHOD

This research is an analytic observation research with a cross-sectional research design. The population of this study was the elderly in the Lubang Buaya district. Sample selection was done by purposive sampling, namely the sampling technique of selecting samples according to the inclusion and exclusion criteria so that a total of 37 people were obtained. The research variables consisted of the independent variables, namely physical activity and dietary patterns, and the dependent variable, namely total cholesterol levels. The data used are primary data obtained directly from respondents through questionnaires and laboratory tests. This study uses a non-parametric comparative test analysis, namely the Chi-Square test with a 95% confidence level.

RESULTS AND DISCUSSION

The study was conducted at the Health Polytechnic of Jakarta III Clinic Chemical Laboratory. The research used by using the purposeful sampling method to obtain research subjects of 37 elderlies of RW 03 Lubang Buaya district that meet the research criteria.

In this study, total cholesterol levels were checked using calorimetry and immunoturbidimetry methods with the Sysmex BX-3010 device, which performs automatic examination procedures ranging from sampling, supplementation of

reagents, incubation, and its light reading. The advantage of the autoanalyzer is that the analytical stages can be done quickly and can be used to examine a large number of samples at the same time.

The research was divided into several variables that were subsequently assembled and presented in the form of tables.

1. Univariate Test

Univariate testing is a test that aims to explain the properties of each variable being studied. The type generally depends on the data obtained for the categorical data type using the frequency distribution ratio or percentage. This univariate test uses SPSS version 22.

Table 1. Univariate Analysis Based on Respondent Distribution

Variable	Frequency	Percentage
Physical Activity		
- Exercise		
Yes	19	51,4%
No	18	48,6%
- Sleep Duration		
Sufficient	23	62,2%
Over	14	37,8%
Dietary Patterns		
- Basic Food Consumption		
Sufficient	19	51,4%
Over	18	48,6%
- Fried Food Consumption		
Often	8	21,6%
Seldom	29	78,4%
- Seafood Consumption		
Often	13	35,1%
Seldom	24	64,9%
- BMI		
Normal	14	37,8%
Obesity	23	62,2%

In Table 1, the distribution of the frequency of the activity of the elderly in the form of exercise was obtained from 19 who did exercise (51.4%) and 18 who did not exercise (48.6%), while the aging activity that formed the duration of sleep was achieved from 23 elderlies who had sufficient sleep (62.2%) and 14 elderlies who slept more (37.8%). The distribution of the frequency of the old age diet consumption of basic foods showed a result of 19 elderlies (51.4%) consuming basic

food with a sufficient category, while those who rarely consume fried food obtained a result of 29 elderlies (78.4%). Furthermore, 24 elderlies (64.9%) rarely consume seafood. Elderlies who followed this study tended to have a body mass index in the obesity category of 62.2% (23) of the elderly.

2. Bivariate Test

The bivariate test is a test used to find out the relationship between two variables, i.e., the free variable being studied and the bound variable. Then the next analysis is a bivariate analysis with statistical testing. The use of this statistical test depends on the data model or variable used.

Table.2 Analysis of Physical Activity on Total Cholesterol Levels

Variable		Normal	High	P Value
Exercise	Yes	16	3	0,038
	No	9	9	
Sleep Duration	Sufficient	19	4	0,027
	Over	6	8	

In Table 2, the results of total cholesterol levels based on physical activity in the form of exercise were obtained 16 elderlies who exercised (43.2%) had normal cholesterol, that is, less than 200 mmol/L, and 9 elderlies who did not exercise had high cholesterol. In this study, the type of exercise respondents did was only light exercise, such as walking, relaxing, and doing homework, i.e., washing, washing, and cleaning the bed. Recommended exercise includes aerobic exercise such as walking, jogging, cycling, and swimming regularly for 30–60 minutes a day (Stewart *et al*., 2017). Exercise can minimize cardiovascular mortality, reduce hospitalization time, and improve quality of life (Rees *et al*., 2016). Any physical activity that uses most of the body's muscles will stimulate the heart and lungs, including aerobic exercise. The muscles most easily moved are the hands and legs, but the activity performed should be long enough (Ali, 2013) to help the metabolism break down fat and cholesterol and lower blood cholesterol levels (Seoharto, 2001; Anakonda, Widiany and Inayah, 2019).

The results of total cholesterol levels based on sleep duration were obtained from 19 elderlies who had enough sleep (51.4%) who had normal cholesterol, which is less than 200 mmol/L, and 8 elderlies (21.6%) whose quality of sleep was higher who had high cholesterol. The analysis of sleep quality in this study was categorized

according to P2PTM Ministry of Health (2018), which states that seniors only need about 6-7 hours of sleep per day. The duration of sleep is regulated by a variety of hormones, such as ghrelin and leptin (Prio, 2015). In the elderly, the circadian rhythm also changes, causing less sensitivity to dark and light changes. Bracelet and light stimulation occurs through the eyes and affect the part of the hypothalamus called the suprachiasmatic nucleus. (NSC). NSC releases neurotransmitters that work on a variety of hormones that regulate body temperature, including cortisol and growth hormone (GH), which play a role in waking up and sleeping (Pasaribu and Simangunsong, 2017).

The data in this study were processed using the Chi-Square test shown in the table above. The results obtained indicated a relationship between the physical activity of exercise and the total cholesterol level (p-value = 0.038), and based on the duration of sleep (p-value = 0.027), this indicates that there is a relationship between the physical activity (exercise and sleep duration) and the overall cholesterol levels.

Table.3 Analysis of Dietary Patterns on Total Cholesterol Levels

Variable		Normal	High	P Value
Basic Food Consumption	Sufficient	16	3	0,038
	Over	9	9	
Fried Food Consumption	Often	4	4	0,394
	Seldom	21	8	
Seafood Consumption	Often	7	6	0,274
	Seldom	18	6	
BMI	Normal	13	1	0,013
	Obesity	12	11	

In Table 3, the results of total cholesterol levels based on basic food consumption show that 16 elderlies (43.2%) who consume basic foods in the category sufficient to have normal cholesterol, that is, less than 200 mmol/L and 9 elderlies (24.3%) in the higher category have high levels of cholesterol. The results of total cholesterol levels based on the consumption of fried food were obtained from 21elderlies (56.7%) who rarely consumed fried food and had a normal cholesterol level of less than 200 mmol/L, and 8 elderlies (21,6%) had high levels of cholesterol. Elderlies who rarely consume seafood obtained results 18 elderlies (48.6%) had a normal cholesterol level of less than 200 mmol/L, and 6 elderlies (16.2%) had high cholesterol levels. Elderlies with a body time index in the normal category had

normal cholesterol levels of 35.1% (13) elderlies and 32.4% (12) in the obese category.

A variable of basic food consumption with p-value (0,038) < 0,05 indicates there is a significant relationship to total cholesterol levels. Elderlies, in the category of excess food consumption, have high levels of cholesterol, as much as 9 elderlies. This may be because excessive carbohydrate intake can lead to increased acetyl-KoA formation from the decarboxylation process of phosphorylation and also increase the formation of cholesterol through complex circuits (Utami *et al*., 2017). The results of this study are consistent with the study conducted by Yanti *et al*., (2020), which concluded that fat and carbohydrate intake affected the blood lipid profile, but physical activity did not affect the blood lipid profile of patients with coronary heart disease.

From the results of this study, the elderly who consumed fried food and seafood did not have a significant relationship with total cholesterol levels. This is because there are elderlies who take medications and vitamins so that cholesterol levels remain within normal limits. According to the theory obtained, the synthesis of cholesterol is affected by several factors, one of which is the decrease in the activity of HMG-CoA reductase, which decomposes the synthetic cholesterol. To decompose the synthesis of cholesterol, i.e., by consuming high fiber and vitamins, so that cholesterol levels in the blood decrease or remain within normal limits (Yani, 2015).

Respondents in this study had a relationship between body time index and total cholesterol levels at a p-value (0,013) < 0,05. Respondents in the obesity category who have normal cholesterol levels may have normal cholesterol levels due to the presence of genetic factors but can control their dietary patterns. The results of this study are consistent with the study conducted by Sulistyoningsih (2020), showing that there is a relationship between body time index (OR 3,200; 95% CI 1,266–8,086) and abdominal circle (OR 3,659; 95% IC 1,422–9,417) and pre-elderly cholesterol levels in Patihan district.

The data in this study were processed using the Chi-Square test shown in the table above. The result obtained is the relationship between the diet consumption of basic foods against the total cholesterol gained value p-value = 0,038, on the basis of the consumption of fried food gained value p-value = 0.394, then on the

consummation of seafood gained value p-value = 0.274, and according to the classification of the type of body time index (BMI) gained value p-value = 0,013 This shows there is a relationship between dietary patterns (consuming basic foods and BMI) to the total level of cholesterol and there is no relationship between dietary patterns (consume fried food and seafood) to total cholesterol levels.

CONCLUSION

Based on the results of this study, it can be concluded that the total elderly of RW 03 Lubang Buaya district is as many as 37 people. There was a relationship between physical activity such as exercise (p-value = 0.038) and sleep patterns (pH = 0.027) against total cholesterol levels. Then, there was a relationship between the diet consumption of basic foods with a p-value of 0.038 and, based on BMI, a p-value of 0.013 to the level of total cholesterol, and there was no relation between the dietary patterns of fried food with a p-value of 0.394 and the consumption of seafood with a p-value of 0.274 to the total level of cholesterol.

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