Substance Intake relationship Nutrition, Body Mass Index, and Physical Activity Against Total Blood Cholesterol Levels In Coronary Heart Disease Patients in hospitals Prabumulih

Agustine Nimas Prata Sena[1] *, Mertien Sa'pang[2], Khairizka Citra Palupi[3]
[123] *Department of Health Science, Faculty of Health Sciences, Esa Unggul University, Jakarta, Indonesia*

Abstract

Background: Coronary heart disease is heart disease caused by narrowing of the coronary arteries so that an interruption in blood flow to the heart muscle. Coronary heart disease is usually caused by fatty deposits that gather in the cells lining the wall of a coronary artery and block blood flow. The main risk factor is a risk factor total cholesterol abnormalities. There are several factors that can affect cholesterol levels, ie intake, body mass index, and physical activity.

Aim: Knowing the relationship intake of saturated fatty acids, PUFA, MUFA, fiber, niacin, vitamin C, magnesium, lycopene, physical activity and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih.

Research methods: This type of quantitative research with cross sectional study design. The population of this research is all outpatient coronary heart disease by 40 respondents. Data taken in this study of the intake of saturated fatty acids, PUFA, MUFA, fiber, magnesium, lycopene, niacin, vitamin C, physical activity and total blood cholesterol levels by researchers. This study data analysis using correlation Pearson Product Moment Correlation.

Research result: The result showed that the average BMI of the respondents was 27.7 ± 3.979 kg / m2, the intake of saturated fatty acids 64.983 ± 31.110 g, 12.163 ± 9.4388 g PUFA, MUFA 16.903 ± 6.497 g, 14.175 ± 6.586 g fiber, magnesium 431.953 ± 191,56mg, 15.57 ± 3.937 mg niacin, vitamin C 72.515 ± 39 099, lycopene 0.048 ± 0.0905, PAL value of 1.721 ± 1.842 physical activity and total blood cholesterol levels of 213.75 ± 37,192mg / dL. There is a relationship between the intake of saturated fatty acids (p = 0.02), MUFA (p = 0.000), fiber (p = 0.016), physical activity (p = 0.000), BMI (p = 0.001) and total blood cholesterol levels. There was no relationship PUFA intake, magnesium, lycopene, niacin, and vitamin C with total blood cholesterol levels (p = 0.682; p = 0.568, p = 0.112, p = 0.062; p = 0.181).

Conclusions and recommendations: The intake of saturated fatty acids, MUFA, fiber, physical activity, BMI is a factor that affects the total blood cholesterol levels. It is advisable to increase the consumption of fiber, MUFA should also perform regular physical activity in order to keep blood cholesterol levels within the limits diajurkan.

Keywords: total blood cholesterol, saturated fatty acids, PUFA, MUFA, fiber, magnesium, lycopene, vitamin C, vitamin B3, physical activity, body mass index

PRELIMINARY

Coronary heart disease is heart disease caused by narrowing of the coronary arteries so that an interruption in blood flow to the heart muscle [1]. Coronary heart disease can cause cardiac dysfunction due to lack of blood the heart muscle due to narrowing of coronary arteries. Clinically, characterized by chest pain or feel uncomfortable in the chest. defined as CHD if ever been diagnosed with coronary heart disease (angina pectoris and / or myocardial infarction) by physicians [2].

Data from the World Health Organization (WHO) in 2012 showed 17.5 million people worldwide die from cardiovascular disease or 31% of the 56.5 million deaths worldwide. More than 3/4 of deaths from cardiovascular disease occur in low-income developing countries tobeing. Of all deaths from cardiovascular disease 7.4 million (42.3%) of them are caused by coronary heart disease (CHD) [3].

Some CHD risk factors including age, genetics, smoking habits, alcohol consumption, high blood pressure (hypertension), diabetes, abnormal lipid profile and low physical activity. High cholesterol levels are 56% of the major contributing factors in the cause of CHD [4]. There are several factors that can affect cholesterol levels, such as intake, especially saturated fat, and low in fiber can increase cholesterol levels [5].

The function of fiber can reduce cholesterol levels by binding the bile acids and excreted with feces, consequently fat can not be absorbed because there is no pengemulsinya and ultimately hinder the risk of coronary heart disease [6, 7]. In addition to these nutrients, some studies showed an increase in HDL cholesterol and a decrease in the corresponding trigliserol after a diet rich in monounsaturated fatty acid (MUFA). Effect on total cholesterol and LDL were not necessarily consistent, but there are no adverse effects on blood lipids were observed [8]. Polyunsaturated fatty acids (PUFAs) also affects the changes in total cholesterol. Effects of PUFA n-6 (omega 6) is replacing saturated fatty acids with n-6 PUFAs also led to a substantial reduction in total cholesterol, thereby reducing the risk of CHD [9], In a number of studies to get the results that niacin and vitamin C each plays a role in fat metabolism to reduce levels of LDL and triglycerides, and increase HDL that can reduce vascular disease and coronary heart disease [10]. The researchers identified 12 studies involving supplementation with lycopene to help lower high cholesterol levels and high blood pressure. This study found that at least 25 mg per day of lycopene (obtained through diet and supplementation) have a significant blood pressure and reduce cholesterol effect. LDL cholesterol is reduced by about 10% which is comparable to the effect of low doses of statins in patients with a slightly higher cholesterol levels [11]. As in several vitamins, there are functions that effect the reduction of cholesterol levels in vitamin C. Vitamin C (ascorbic acid) is known as one of the useful antioxidants help hydroxylation reactions in the

formation of bile salts. With the increased formation of bile salts increases the excretion of cholesterol so that it can lower blood cholesterol levels [12].

In obese people there is an increase in total body fat. Today, the body mass index (BMI) is one of the parameters that can be used in determining the criteria for the proportion of a person's body. This is because BMI correlates with the amount of total fat in the human body that can describe a person's weight status [13].

In addition, physical activity is just sitting constantly in work (sedentary) and lack of exercise can increase the risk of CHD. Regular activity will increase the activity of the enzyme lipoprotein lipase (LPL) and hepatic lipase enzyme activity lowers. Lipoprotein lipase helps remove LDL from the blood to the liver, and then converted into bile or secreted so that the levels of LDL and cholesterol levels decreased [14].

Of the annual report on hospital outpatient unit Prabumulih in 2016 there were 216 cases of CHD of 10 025 outpatients in hospitals Prabumulih or by 2.1% and increased in 2017 with the number of cases of CHD 276 of 9467 outpatients in hospitals Prabumulih or by 2.9%.

The purpose of this study is determine the relationship between nutrient intake (saturated fat, fiber, MUFA and PUFA, Magnesium, Lycopene, vit.c, Vit. B3), body mass index and physical activity and total blood cholesterol levels in patients with coronary heart disease in hospitals Prabumulih.

RESEARCH METHODS

Research design

The study design used is analytical research with cross sectional approach. The research was conducted in hospitals Prabumulih in August 2018 by measuring intake of saturated fat, fiber, MUFA, PUFA, Magnesium, Lycopene, Vitamin C, Vitamin B3, body mass index, physical activity, and total blood cholesterol levels at that time.

Data source

The data used in this study are primary data obtained from several methods. Data Characteristics of respondents include age, education level, job retention waawancara obtained by using a common questionnaire instrument.

Data intake of saturated fat, fiber, MUFA, PUFA, Magnesium, Lycopene, Vitamin C, Vitamin B3, obtained using a semi-quantitative food frequency questionnaire and analyzed using Nutrisurvey program.

BMI data obtained from the data of weight and height until measured with digital scales for microtoice's weight and height. Then calculated by weight in kilograms divided by the square of height in meters. Physical activity data were obtained using a physical activity level kuesioer *recall 3x24 hours.*

Research Goals

The population in this study were all patients Women with Coronary Heart Disease the outpatient in hospitals Prabumulih with the number of patients 40. All patients with coronary heart disease who outpatient sampled.

Data Analysis Techniques

Data characteristics of respondents and the respective data variables were analyzed descriptively. Bivariate analysis to examine the relationship or correlation significance with 95% confidence level. Spearman correlation test was used for all data variables are not normally distributed.

RESULTS AND DISCUSSION

characteristics of Respondents

Characteristics of the respondents, age, education and pekejaan in female patients Coronary heart disease patients are shown in Table 1. Based on the analysis mostly aged 46-55 years and most have low education levels. According to the livelihoods of the majority of respondents are farmer mother.

Intake of Saturated Fatty Acids

Data intake of saturated fatty acids obtained using a semi-quantitative food frequency over the last month. Then calculated the average intake of dietary sources of saturated fatty acids of respondents and analyzed daily receipts Nutrisurvey program. Median intake of saturated fatty acids of respondents of 58.5 grams. Can be seen in Table 2.

PUFA intake

PUFA intake data was obtained using a semi-quantitative food frequency over the last month. Then calculated the average daily dietary intake of PUFA sources respondents and analyzed receipts Nutrisurvey program. Median intake of PUFA respondents is 10.30 grams. Can be seen in Table 2.

MUFA intake

MUFA intake data was obtained using a semi-quantitative food frequency over the last month. Then calculated the average daily dietary intake of MUFA sources respondents and analyzed receipts Nutrisurvey program. The average intake of MUFA respondents was 16.90 ± 6.49 grams. Can be seen in Table 2.

Fiber intake

Fiber intake data was obtained using a semi-quantitative food frequency over the last month. Then calculated the average daily dietary intake of fiber sources and analyzed receipts respondents Nutrisurvey program. Median intake of fiber respondents is 12.70 grams. Can be seen in Table 2.

intake of Magnesium

Magnesium intake data was obtained using a semi-quantitative food frequency over the last month. Then calculated the average daily intake of food sources of magnesium respondents and analyzed receipts Nutrisurvey program. Median intake of magnesium respondents amounted to 375.95 mg. Can be seen in Table 2.

Intake of Vitamin B3 (Niacin)

Data intake of vitamin B3 (niacin) is obtained using a semi-quantitative food frequency over the last month. Then calculated the average intake of dietary sources of vitamin B3 respondents and analyzed daily receipts Nutrisurvey program. Median intake of vitamin B3 respondents is 14.20 mg. Can be seen in Table 2.

Intake of Vitamin C

Data intake of vitamin C was obtained using a semi-quantitative food frequency over the last month. Then

calculated the average intake of food sources of vitamin C daily and analyzed receipts respondents Nutrisurvey program. Median intake of vitamin C respondents is 57.80 mg. Can be seen in Table 2.

Lycopene intake

Lycopene intake data was obtained using a semi-quantitative food frequency over the last month. Then calculated the average daily intake of food sources of lycopene respondents and analyzed receipts Nutrisurvey program. Median intake of 0.00 mg of lycopene respondents. Can be seen in Table 2.

Physical activity

Physical activity data obtained using*level of physical activity recall* 3x24 hours.Then the calculated value of PAL respondent by means of PAR value multiplied Median duration of activity of physical activity respondents PAL value is 1.80, Respondents' level of physical activity medium category can be seen on the table 2.

Body Mass Index (BMI)

BMI data were acquired using height and weight measuring sample, Then calculated with the formula BMI (kg / m2). It is known that most of the respondents had an average BMI of 27.70 ± 3.97 can be seen in Table 2.

Table 1. Distribution of respondents by Characteristics

Age	**n**	**%**
> 65 Years	9	20.0
36-45 Years	9	20.0
46-55 Years	14	31.1
56-65 Years	13	28.9
Total	45	100.0
Education	**n**	**%**
Low education	19	47.5
Middle education	14	35.0
higher education	7	17.5
Total	40	100.0
Work	**n**	**%**
farmer	13	32.5
PNS	6	15.0
IRT	9	22.5
entrepreneur	12	30.0
Total	40	100.0

Table 2. Distribution of substance intake Nutrition, Physical Activity, BMI and total blood cholesterol levels.

variables	Mean ± SD	Min-Max
Body mass index (kg / m2)	27.70 ± 3.97	18.0 to 37.8
MUFA intake (grams)	16.90 ± 6.49	5.3 to 29.2
variables	**median**	**Min-Max**
PUFA intake (grams)	10,30	3.8 to 62.0
Fiber intake (grams)	12.70	4.3 to 32.9
Magnesium intake (mg)	375.95	240.5 to 1026.7
Niacin intake (mg)	14.20	10.8 to 24.0
Intake of Vitamin C (mg)	57.80	187.4 21,7-
Lycopene intake (mg)	0,00	0 to 0.3
Physical activity (PAL)	1.80	1.5 to 2.4
Total Blood Cholesterol (mg / dL)	217.00	144-300
Saturated fatty acid intake (grams)	58.85	15.6 to 132

Total Blood Cholesterol Levels

Total blood cholesterol levels of data obtained by direct measurement after the respondent not taking cholesterol-lowering drugs the day before the examination. The level of total blood cholesterol using cholesterol striptest Easy Touch. Median fasting blood glucose levels of 217.00 mg / dL. Can be seen in Table 2.

Correlation Substance Intake Nutrition, Physical Activity, BMI and Total Blood Cholesterol Levels

Based on Spearman correlation test results showed that the value of p = 0.02 (p <0.05), ie there is a significant relationship between the intake of saturated fatty acids and total cholesterol levels in patients with Coronary Heart Disease Hospital Prabumulih. Values obtained correlation coefficient (r) = 0.475. Variable intake of saturated fatty acids and total blood cholesterol levels have a relationship that is being patterned positive, meaning that an increase in one variable followed by an increase in other variables. The higher intake of saturated fatty acids, the higher the total blood cholesterol levels.

Based on the results of Spearman correlation test showed the value of p = 0.000 (p <0.05) that there was a significant association between the intake of MUFA and total cholesterol levels in patients with Coronary Heart Disease Hospital Prabumulih. Variable intake of MUFA and total blood cholesterol levels have a strong relationship and a negative pattern, meaning a decrease followed by an increase of the variable other variables.

Thus, the lower the intake of MUFA the higher total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.682 (p> 0.05), which means that there is no significant relationship between PUFA intake and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. Variable intake of PUFA and total blood cholesterol levels have a weak correlation and negative pattern, meaning a decrease followed by an increase of the variable other variables. The lower the PUFA intake, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.016 (p <0.05), which means that there is a significant association between fiber intake and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. VVariabel fiber intake and total blood cholesterol levels have a relationship that is being patterned negative, meaning a decrease followed by an increase of the variable other variables. The lower intake of fiber, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.062 (p> 0.05), which means that there is no significant relationship between the intake of niacin and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. Variable intake of Niacin and total blood cholesterol levels have a weak relationship and patterned positive, meaning that an increase in one variable followed by an increase in other variables. The higher the intake of niacin, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.181 (p> 0.05), which means that there is no significant relationship between vitamin C intake and total blood cholesterol levels of CHD patients in hospitals Prabumulih. Variable intake of vitamin C and total blood cholesterol levels have a weak correlation and negative pattern, meaning a decrease followed by an increase of the variable other variables. The lower the Vitaimn C intake, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.112 (p> 0.05), which means that there is no significant correlation between lycopene intake and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. Variable intake of lycopene and total blood cholesterol level has a weak relationship and patterned positive, meaning that an increase in one variable followed by increase in other variables. The higher intake of lycopene, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.568 (p> 0.05), which means that there is no significant relationship between magnesium intake and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. Variable intake of magnesium and total blood cholesterol levels have a weak relationship and patterned positive, meaning that an increase in one variable followed by increase in other variables. The higher

intake of magnesium, the higher the total blood cholesterol levels.

Based on Spearman correlation test results showed that the value of p = 0.0001 (p <0.05), which means that there is a significant relationship between physical activity and total blood cholesterol levels of patients with coronary heart disease in hospitals Prabumulih. Variable physical activity and total blood cholesterol levels have a relationship that is being patterned negative, meaning a decrease followed by an increase of the variable other variables. The lower the level of physical activity, the higher the total blood cholesterol levels.

Based on Pearson correlation test results demonstrate the value of p = 0.001 (p <0.05) that there is a significant correlation between body mass index and total cholesterol levels in patients with Coronary Heart Disease Hospital Prabumulih. Variable intake and body mass index, total blood cholesterol levels have a strong relationship and patterned positive, meaning that the increase in one variable followed by increase in other variables. Thus, the higher the body mass index, the higher the total blood cholesterol levels.

Table 4. Correlation Substance Intake Nutrition, Physical Activity, BMI and Total Blood Cholesterol Levels

variables	R	p value
Intake of Saturated Fatty Acids	0.475	**0.02**
PUFA intake	-0.067	**0.682**
MUFA intake	0.659	**0,000**
Fiber intake	-0.378	**0,016**
Intake of Vitamin B3 (Niacin)	.298	**0,062**
Intake of Vitamin C	-0.216	**.181**
intake of Magnesium	0.093	**0,568**
Lycopene intake	.255	**0.112**
Physical activity	-0.687	**0.0001**
Body mass index	0.511	**0,001**

DISCUSSION

Correlation of Nutrient Substance Intake, Body Mass Index, Physical Activity and Total Blood Cholesterol Levels

Saturated fatty acids are fatty acids with a single bond. Most of the saturated fatty acid is a straight hydrocarbon chain with an even number of carbon atoms. The most commonly contains 12-22 carbon atoms. These fats are fats that can not bind the hydrogen again, such as palmitic acid and stearic acid which is found in animal fats, cheese, butter, coconut oil, and chocolate [15, 16].

The results of this research note intake of saturated fatty acids and total blood cholesterol levels have a significant relationship. The higher intake of saturated fatty acids, the higher the total blood cholesterol levels. These results are consistent with research conducted by Tuminah (2009) which states that a diet such as the consumption of foods high in fat total or saturated fat, cholesterol is a factor that affects the levels of HDL and is a risk factor for CHD [17]. According to Yusuf et al (2013), stating that the consumption of fat, especially saturated fatty acids, will affect the levels of Low Density Lipoprotein (LDL), which causes blood easy to agglomerate, other than that of saturated fatty acids can damage the walls of arteries, causing the narrowing [18]. Epidemiological studies conducted Hardinsyah (2011),

These fatty acids have one double bond in the carbon chain. The most common Monoen has a chain length of 16-22 and bond with cis configuration. This means that the hydrogen atoms on either side of the double bond oriented in the same direction [16]. One example of this fatty acid is oleic and animal fat and vegetable source that is fluid, particularly olive oil and avocado [15]. The results of this research note MUFA intake and total blood cholesterol levels have a significant relationship. the higher the intake of MUFA, the higher the total blood cholesterol levels. These results are consistent with research conducted by Delmi Sulastri in 2003 against male ethnic Minangkabau, West Sumatra. Results showed no association MUFA intake on levels of total cholesterol ($p = 0.009$).

MUFA effect on changes in total blood cholesterol. Replacing saturated fatty acids with MUFA also led to a substantial reduction in total cholesterol and LDL cholesterol, cholesterol ratio reduction - total cholesterol / HDL and thus can reduce the risk of CHD [9],

Dietary fiber, also known as dietary fiber or dietary fiber, is part of a plant that can be consumed and composed of carbohydrates that have properties resistant to digestion and absorption in the human small intestine and fermented in whole or part of the large intestine. Muchtadi (2001) states that dietary fiber is the part of food that can not be dihirolisis by enzymes, while D'Meyer (2004) defines fiber as part of the integral of the foodstuffs consumed daily with the main source of plant, vegetable -sayuran, cereals, fruits, nuts.Epidemologik data show that consumption of dietary fiber has a negative correlation with the incidence of coronary heart disease and kidney stones, especially with blood cholesterol. Water-soluble non-starch Polisakaridan (pectin, gum, etc.) the most influential while nonpati insoluble

polysaccharide water has only a small effect on cholesterol levels. This decrease is mainly seen in the LDL fraction accompanied by a decrease in the cholesterol content in the liver and other tissues[7].

The results of this research note that the intake of fiber and total blood cholesterol levels have a significant relationship. The lower intake of fiber, the higher the total blood cholesterol levels. This research is in line with research Nashriati et al (2013), that 66.7% of respondents with fiber consumption is not good, have high cholesterol. That is the lack of fiber consumption is associated with increased total cholesterol levels. This is in line with research Surya (2009) that the fiber can reduce cholesterol levels in blood plasma to reduce and prevent the risk of disease kardiovalkuler.

This influence is associated with the metabolism of bile acids. Bile acids and neutral steroids are synthesized in the liver from cholesterol, secreted into bile and usually return reasorbsi banking through the small intestine (entero hepatic cycle). Fiber allegedly blocking this cycle by absorbing new bile acids from cholesterol inventory. Cholesterol reduction is thought to occur through this process [7].

To determine the nutritional status of a person, the method can be used is to calculate a person's body mass index (BMI). Primarily related to the increase and weight loss that can be maintained normal weight and allow someone has a life expectancy longer. A person with a body weight below the limit minimu (underweight or thinness) are at increased risk of infectious diseases, while that is above the maximum limit (overweight or obesity) have a high risk of degenerative diseases.

The results of this research note that the body mass index and total blood cholesterol levels have a significant relationship. The higher the body mass index, the higher the total blood cholesterol levels. These results are consistent with research Musdalifa (2017) that there is a relationship between BMI with total blood cholesterol levels by Pearson correlation analysis was obtained p-value (0.001) <0.05. This is because in an obese person are metabolic disorders so that the energy of the body carried to the liver to become fatty. It can improve blood lipid levels (Free Fatty Acid or FFA). According to Ashton (2001), the weight gain can significantly increase the incidence of angina pectoris and also predicted the onset of coronary disease and the incidence of congestive heart failure (congestive heart failure).

Almatsier (2009) states that physical activity is done by the muscle movements of the body and its supporting systems [7]. Riyadi (2006) stated that given the amount of energy the body that have been issued during daily activities, then the actual amount of energy that a person needs, assuming the daily activity is a normal daily activity for a healthy life (Aziza, 2008). The energy used to exercising in the catabolism of energy can result in the body, it can lower blood cholesterol levels [13].

The results of this research it is known that physical activity and total blood cholesterol levels have a significant relationship. The lower the physical activity, the higher the total

blood cholesterol levels. This is in line with research Zuhroiyyah, et al (2017) which states that there is a significant relationship between physical activity levels of total blood cholesterol. With a correlation coefficient r = -0.349 (p <0.001). These results are also consistent with the theory that when doing physical activity, the body will make the creation of new energy in the form of adenosine triphosphate (ATP) from the food consumed. So that the food consumed is not much molded into cholesterol, resulting in total cholesterol levels in the body decrease. The results of this study are also in line with the results of research conducted by stumps Waloya in 2013 and research by Paul D.Lopirinzi and Ovuokerie Addoh in 2016 [20].

PUFAs have double bonds that more than one in the carbon chain and has several open points to bind hydrogen. An example is linoleic acid which is abundant in sunflower seeds, corn oil and soybean oil; omega-6 fatty acids are found in many vegetable oils; Omega-3 fatty acids, eicosapentaenoic acid (EPA), and dokosaheksapentanoat acid (DHA) are widely found in fish oil [15].

The results of this research note magnesium intake and total blood cholesterol levels had no significant relationship. These results are similar to studies Sulastri et al (2005) found no significant relationship between PUFA intake and total blood cholesterol levels. PUFA, particularly linoleic, tends to lower total and LDL cholesterol, but this effect is only half of the effect of increased cholesterol by saturated fatty acids, PUFAs have hipokolesterol but inconsistent effect. The ratio PUA / saturated fatty acids + - 0.2 tends to increase cholesterol and more atherogenic, while the ratio of> 0.8 is more hipokolesterol and less atherogenic. The recommended ratio is 1.5 for the ratio of more than 1.5 resulted in a decrease in total cholesterol levels (Kris, 2004). In this study the ratio of polyunsaturated / saturated fatty acids is 0,

Magnesium intracellularly in liver tissue and is higher than in the blood stream. In the extracellular amount of magnesium less, but is required for nerve impulse conduction to occur in normal muscle contraction. Sufficient magnesium intake for adults is 300 to 420 mg per day. Magnesium is absorbed in the small intestine using a carrier protein or passive diffusion. Vitamin D and lactose may increase the absorption of magnesium. Instead absence of calcium, phytate, phosphate, alcohol, and fat can decrease the absorption of magnesium. Magnesium metabolism is controlled by the thyroid gland, which is the increased uptake of magnesium case paratiorid hormone secretion due to decreased levels of magnesium in the serum. Magnesium excretion through the kidneys do [21].

The results of this research note magnesium intake and total blood cholesterol levels had no significant relationship. These results are similar to studies Wijayanti et al (2014) which is based on a test Pearson's product moment obtained p-value 0.233 which means there is no significant correlation between magnesium intake with total blood cholesterol levels. A source of magnesium which is consumed mostly from types of cereals such as rice and corn with a frequency of 2-3 times / day, animal dishes such as tofu, tempeh, peanuts, soybeans, red beans

and 1-2 times / day, as well as green vegetables like spinach, mustard greens, and beans. Such foods include foods with high magnesium content which biasadikonsumsi. However, it should be aware of substances that can inhibit the absorption of magnesium in the body such as phytic acid in grains.

Lycopene or what is often referred to as α-carotene is a bright red carotenoid pigment, found in tomatoes and other fruits that are red. Lycopene is a carotenoid that is needed by the body and is a very powerful antioxidant. Ability to control free radicals is 100 times more efficient than vitamin E or 12500 times on gluthation. In addition to anti-aging skin, lycopene also has a protective effect against cardiovascular disease, diabetes, osteoporosis, infertility, and cancer, especially prostate cancer.

Rao and Rao (2003) indicate that lycopene stimulates the cells parameters that are important for bone formation and prevents cells play a role in fulfilling its function in bone resorption [23].

The results of this research note intake of lycopene and total blood cholesterol levels had no significant relationship. These results are similar to studies conducted by Sulastri, et al (2005) found no significant association between lycopene and total blood cholesterol levels. This is probably due to the intake of lycopene is still very low in order to affect the absorption or total blood cholesterol levels. From the data intake, it was found that the average intake of lycopene has only 0,048 with a maximum intake is 0.3 mg [19].

Vitamin C is a vitamin for humans and other primates. In species that take it as a vitamin, there is a barrier in the path because of the absence of glukonolakton oxidase. Ascorbic acid has a special role in containing iron-related hydroxylase-a-ketoglutarate. These acids also increase the activity of other enzymes in vitro, although this is a reduction of non-specific activity. In addition, the effects of these acid nonenzim due to his activities as a reducing agent and oxygen radical fighters. Signs of vitamin C deficiency are skin changes, blood capillary fragility, softening of the gums, teeth, and bone fractures. Many of these symptoms can be related to a lack of collagen synthesis. As for the intake above about 100 mg / day, the body's capacity to metabolize vitamin C experiencing burnout, and a higher intake will be excreted in the urine. However, additional other seal the document states that vitamin C enhances the absorption of inorganic iron, and this is dependent on the presence of vitamins in the gut. Therefore, an increased intake of vitamin C may be beneficial [24].

The results of this research note intake of vitamin C and total blood cholesterol levels had no significant relationship. These results are similar to studies conducted by Muzakar et al (2010) based on the results of correlation which results are not seen significant correlation between vitamin C intake and blood cholesterol levels in total. This is probably due to the intake of vitamin C is still very low in order to affect the absorption or total blood cholesterol levels. Of the average total intake obtained in this study, the intake of vitamin C is still less than the intake of the recommendations of the Ministry

of Health is 75 mg for women and 90 mg for men [3].

Niacin is a vitamin that is synthesized in the body from the essential amino acid tryptophan. Two compounds, nicotinic acid and nicotinamide, has the biological activity of niacin; metabolic function is as a coenzyme nicotinamide ring in NAD and NADP in oxidation / reduction. Approximately 60 mg of tryptophan is equivalent to 1 mg of niacin in the diet. Niacin can be toxic if excessive. Nicotinic acid is used to treat hyperlipidemia and if used in the range of 1-6 mg / day may cause dilation of blood vessels and flushing and skin irritation. Nicotinic acid and nicotinamide intake which exceeds 500 mg / day also causes liver damage [24].

The results of this research note niacin intake and total blood cholesterol levels had no significant relationship. These results are similar to studies conducted by Muzakar et al (2010) based on the results of correlation which results are not seen significant correlation between the intake of niacin and total blood cholesterol levels.Niacin is known to reduce levels of LDL (bad) cholesterol and triglycerides as much as 5-20% as much as 20-50%. Niacin has the ability to inhibit the production of VLDL, lipoprotein which one constituent is LDL and triglycerides. Niacin is also known to increase HDL by 15-35% by lowering the rate of decomposition of the HDL compounds. However, this effect was recently discovered when taking niacin in very many [25].

CONCLUSION

There is a significant association between the intake of saturated fatty acids, MUFA, body mass index, physical activity, and total blood cholesterol levels.

SUGGESTION

Coronary Heart Disease Patients are advised to eat foods that can lower blood cholesterol levels. It is also recommended to increase the consumption of fiber, MUFA should also perform regular physical activity in order to keep blood cholesterol levels within the limits diajurkan.

The results of this study can be used as a reference for future research. This study can also be forwarded in CHD patients at different hospitals with more samples.

CREDIT

Enumerator, doctors, nutritionists and all respondents involved in this study.

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AUTHOR CONTRIBUTIONS

RTP was instrumental in developing research questions, design and conduct the first penelitian.Penulis.

YW instrumental in developing research questions, design the study and revise the draft and draft critical-Trustees research data analysis and the final draft.

IJ instrumental in developing research questions, design the study and revise the draft, and the draft critical-Trustees research data analysis and the final draft.

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