MPPKI (August, 2024) Vol. 7 No. 8

ISSN 2597– 6052

DOI: https://doi.org/10.56338/mppki.v7i8.5819

MPPKI

Media Publikasi Promosi Kesehatan Indonesia

The Indonesian Journal of Health Promotion

Research Articles *Open Access*

The Effect of Chronic Disease Management Program to Hiperkolesterol Diseases at Indonesian Worker he Companies

Rian Nurahman[1]*, Suhat[2], Novie Muliku[3], Dyan Kunthi N[4]

[1]Fakultas Ilmu Dan Teknologi Kesehatan Universitas Jenderal Achmad Yani, Cimahi, | email riansandianurahman@gmail.com

[2]Fakultas Ilmu Dan Teknologi Kesehatan Universitas Jenderal Achmad Yani, Cimahi | email suhat19673@gmail.com

[3]Fakultas Ilmu Dan Teknologi Kesehatan Universitas Jenderal Achmad Yani, Cimahi | email noviemauliku@gmail.com

[4]Fakultas Ilmu Dan Teknologi Kesehatan Universitas Jenderal Achmad Yani, Cimahi | email dyankunthi@yahoo.co.id

*Author Corespondence: riansandianurahman@gmail.com

ABSTRACT

Introduction: Hypercholesterol is an increase in cholesterol levels in the blood that exceeds normal limits. Based on MCU employees result in 2022, there were 288 people suffering from hypercholesterol, out of 591 total HE employees. The Chronic Disease Management Program (CDMP) intervention is one of the efforts used to overcome this disease.

Objective: The aim of this study was to determine the effect of CDMP on reducing high total cholesterol levels in offshore workers at Indonesian HE's companies.

Method: The research design used a quasi experiment, pretest-posttest with control group design. The population is offshore workers who suffer from hyperchoelsterol. the sample size is 30 people in each group. Dependent variable is total cholesterol levels and the independent variables CDMP that are aerobic exercise, diet planning and health education. The sampling technique uses purposive sampling. The statistical analysis used was univariate and bivariate, with paired sample T-Test and independent sample T-test, and to measure the effectiveness of the program, it is determined based on the N-Gain Percent.

Result: The results of the study showed differences in total cholesterol levels before and after the CDMP intervention in the intervention group (p-value=0.000) and the control group (p-value=0.000). The results of different test after CDMP intervention between both groups showed (p-value=0.000), The N-Gain score for the intervention group was 71% and for the control group was 40%, so the effectiveness of CDMP intervention on reducing total cholesterol by by 31%.

Conclusion: The CDMP intervention was quite effective in reducing total cholesterol levels in the intervention group compared to the control group by 31%. It is recommended for hypercholesterol's person to carry out CDMP intervention through controlling aerobic exercise, diet planning, and regular health education.

Keywords: CDMP Intervention; Hypercholesterol; Offshore Workers

INTRODUCTION

Hypercholesterolemia is a state of increased cholesterol levels in the blood that exceeds the normal limit, namely ≥ 240 mg/dl (1). The normal value for total cholesterol is ≥ 200 mg/dL. Cholesterol is one part of fat or lipid, but they are two different substances. Cholesterol is a complex fat compound, most of the body's cholesterol is produced by the body itself, and the liver is the largest contributor of cholesterol in the body (2). Cholesterol classification is divided into 2 types, namely: Firstly, Low Density Lipoprotein (LDL) is a type of cholesterol that can have a bad impact on the body if the levels are too high. This is because LDL has atherogenic properties (easily sticks to the walls of blood vessels and reduces the formation of LDL receptors (3). Because of its evil nature, LDL or bad cholesterol should be at a low level or can be tolerated by the body, namely less than 100 mg/ dL. An LDL amount of 100-129 mg/dL can be said to be the tolerance threshold. If it exceeds this amount, bad cholesterol can cause various health problems such as atheroma, heart disease and stroke.

Hypercholesterolemia is a condition that shows levels of low density lipoprotein (LDL) in the blood that are higher than normal, which can result in the formation of plaque in the blood vessels which increases over time and accumulates so that blood flow to the brain can be disrupted. In this condition, total cholesterol will rise, which can trigger the formation of atherosclerosis and increase strokes (4).Second, High Density Lipoprotein (HDL) is cholesterol that is beneficial for the body. The function of HDL is to transport LDL from the periphery to the liver. An HDL level of at least 60 mg/dL or more can help reduce the risk of heart disease. On the other hand, HDL levels of less than 40 mg/dL actually increase the risk of heart disease (5).

Based on data from the World Health Organization (WHO) in 2018, hypercholesterolemia was recorded for more than 160 million people in the world who had total cholesterol levels >200 mg/dl, which is in the quite high category. Based on data from the American Heart Association in 2018, it shows that the prevalence of American adults with cholesterol levels ≥ 240 mg/dl is 31.9 million people (13.8%) of the total population. The prevalence of hypercholesterolemia in Southeast Asia is around 30% and in Indonesia 35% (6).

Basic Health Research (Riskesdas) in 2018 showed that 28.8% of the Indonesian population aged ≥15 years had total cholesterol levels ≥200 mg/dL and 27.9% had triglyceride (TG) levels ≥150 mg/dL. Based on employee MCU results in 2022, in Indonesian HE companies there were 288 people suffering from hypercholesterolemia with cholesterol out of 591 total HE employees or 48.7% of the Indonesian HE employee population.

Cholesterol levels in the blood can be influenced by 2 risk factors, namely factors that can be changed and factors that cannot be changed [8]. Risk factors that cannot be changed include age, gender, and genetics. Increasing age with high cholesterol triggers greater atherosclerosis (6). Meanwhile, risk factors that can be changed include diet (nutrient intake) or nutritional status, lack of physical activity, lack of knowledge, obesity, smoking and stress (7).

The Chronic Disease Management Program (CDMP) is a wellness program that aims to prevent and manage chronic diseases in the company. This CMDP intervention consists of pharmacological and non-pharmacological treatment programs. Treatment is pharmacological in nature, where the intervention of this program is in the form of health monitoring and teleconsultation with an internist or company doctor as well as administration of anti-cholesterol medication. Meanwhile, non-pharmacological therapy in this CDMP activity includes aerobic exercise, diet planning and health education.

The recommended aerobic exercise is an exercise program that includes at least 30 minutes with moderate intensity (reducing 4-7 kcal/minute) 4 to 6 times a week, with a minimum expenditure of 200 kcal/day, which can have an effect on reducing blood cholesterol levels if done routinely and continuously. Regular exercise can have a positive impact on a person's fitness, such as increasing the ability to use oxygen and cardiac output, working efficiency of the heart muscle, increasing the body's metabolism and muscle capacity (8).

Diet planning activities, controlling and measuring the average daily cholesterol requirements of respondents so that daily cholesterol requirements are no more than 300 mg/day, by arranging a menu of healthy, low cholesterol foods on respondents' plates, because consumption of foods high in fat, especially from animal sources, will increase cholesterol levels total. So the diet that can be used to lower LDL cholesterol is a diet of unsaturated fatty acids such as MUFA (Monounsaturated Fatty Acids) and PUFA (Polyunsaturated Fatty Acids) because the dietary factor that has the most influence on increasing LDL cholesterol concentrations is saturated fatty acids (9). Patients with hypercholesterolemia are advised to reduce their intake of saturated fat and unsaturated Trans fat to <7-10% of total energy.

Health education about low fat and cholesterol diet intake can help workers reduce their intake of low fat and low cholesterol foods which is useful for reducing the risk of developing degenerative diseases (10). The method for implementing health education is by watching videos which are carried out regularly as an introduction to provide knowledge to participants regarding the meaning of hypercholesterol, consumption patterns of low fat diets as an effort to prevent hypercholesterol, which ends with a discussion and question and answer

METHOD

The design of this research is quasi experimental pre post test with control group design. The target population in this study were all offshore worker sufferering of hypercholesterol, with sample size 30 people in each group. The sampling technique used in this research used a purposive sampling technique. The sample inclusion criteria in this study are as follows: 1) Respondent's age ≥ 30 years. 2) Willing to become a respondent by signing informed consent. 3) Get anticholesterol drug therapy, namely simvastatin 10 mg.

Exclusion criteria include: worker suffering hypercholesterol with comorbidities, such as diabetes mellitus Type II and high blood pressure. The research will be carried out at the offshore facilities of the ANOA Platform and Gajah Baru Platform in the Indonesia HE company, starting from 25 Nov – 16 Dec 2023 for 21 days. This research has received Research Ethics recommendation No: 07/KEPK/FITKes-UNJANI/XI/2023.Ethics in this research pay attention to informed consent and the confidentiality and security of respondents. The following are the steps taken in this research flow: 1) Initial administration. 2) Sample selection and. 3) The research implementation stages are as follows:

Carrying out sampling based on inclusion criteria and finally the selected samples became research subjects, The data collection process starts from asked to fill out informed consent, given an understanding of the purpose of research, the benefits of research and given an explanation regarding the implementation of interventions that will be carried out during the research period, such as carrying out aerobic exercise 3 times a week with a duration of 50 minutes for each meeting. Implementation of diet planning by arranging a healthy, low-cholesterol diet on the respondent's plate based on menu advice from a nutritionist and health education by watching a cholesterol education video which is carried out after aerobic exercise with a duration of 5 minutes. Both groups received simvastatin therapy 10 mg once a day before bed. After all the data was obtained and collected, the researcher then carried out data processing and analysis.

Data analysis carried out in this research included univariate analysis and bivariate analysis. Univariate analysis in this study is to describe the characteristics of respondents, such as: Age, physical activity, BMI (body mass index), and stress scale in both groups both before and after treatment, while bivariate analysis is used in this study to see differences in results between variables. Independent, namely CDMP intervention with the dependent variable, namely total cholesterol levels. Bivariate analysis was carried out by researchers at this time, first carrying out normality tests and homogeneity tests.

Testing the normality of the data using the Kolmogorov – Smirnov test, it was found that the data for all groups, both intervention (pre and post) and control groups (pre and post), had a Sig value >0.05, so all data was normally distributed. In the homogeneity test with the Levene test, data was obtained from the average value of post-test cholesterol levels for the intervention group or control group (base on mean), with a value of sig. 0.195 > 0.05, which means that the data is homogeneous, so an independent sample T-Test can be carried out.

To determine the effectiveness of the intervention carried out, it can be done based on the N-Gain value in the form of a score or percentage. The criteria used to state which treatment is more effective between the control group and the intervention group are as follows: 1) If the effectiveness is >1 then there is a difference in effectiveness where reducing total cholesterol levels in the intervention group is more effective than in the control group. 2) If effectiveness = 1 then there is no difference in the effectiveness of reducing total cholesterol levels in the intervention group and the control group. 3) If the effectiveness is <1 then there is a difference in effectiveness where reducing total cholesterol levels in the control group is more effective than in the intervention group.

RESULTS

Description of Characteristics Respondents

Tabel 1. Characteristics Respondents

Characteristics	Group			
	Intervention		Control	
	Total	%	Total	%
Age				
≤40 year old	7	23.3	8	26.6
≥40 Year old	23	76.6	22	73.3
Physical Activity				
≥150 Minutes/Week	6	20	7	23.3
≤150 Minutes/ Week	24	80	23	76.6
BMI				
Underweight	0	0	0	0
Normal	17	56.6	12	40
Overweight	12	40	14	46.6
Obesitas	1	3.33	4	13.3
Stress Scale				
Normal	22	73.3	18	60
Low	5	16.6	7	23.3
Moderate	3	10	5	16.6
High	0	0	0	0

Based on table 1 the characteristics of respondents based on age is both group were dominated by people aged more than 40 years, for distribution frequency of respondents based on exercise habits (Physical Activity), both groups were dominated by respondents who did not exercise enough. Based on BMI (Body Mass Index) the distribution frequency, the intervention group were dominated by responden with normal BMI there were 17 people and the control group was dominated by respondents who were overweight which risk of obesity with total 18 responden . In measuring stress using Form DASS 42, the data obtained from the intervention group was 22 people with normal categories and control group was 18 responden with normal categories, so both group were dominated by normal stress scale.

Analyzing Differences in Total Cholesterol Levels Before and After in the Intervention Group and Control Group in Offshore Workers in Indonesian HE Companies

Tabel 2. Pre and post total cholesterol levels in the intervention group and control group

Value	Intervention Group			Control Group		
	Pretest	Postest	Degradation	Pretest	Postest	Degradation
Value Min.	210	165	21	201	176	4
Value Max.	287	204	88	282	235	65
Mean	239	186	53.2	227	201	26
Median	236	187	51.5	221	199	22

Based on Table 2, it is known that the average pre-test cholesterol level in the intervention group was 239 mg/dl with the lowest value being 210 mg/dl and the highest value being 287 mg/dl. After being given CDMP intervention (aerobic exercise, diet planning and health care) for 21 days, total cholesterol levels decreased with an average of 186 mg/dl, with the lowest total cholesterol level being 165 mg/dl and the highest cholesterol level being 204 mg/dl. This shows a decrease in cholesterol levels between 21 mg/dl to 88 mg/dl.

The average cholesterol level value in the control group was 227 mg/dl, with the lowest value being 201 mg/dl and the highest value being 282 mg/dl. After 21 days, the average total cholesterol level in the control group was 201 mg/dl, with the lowest value being 176 mg/dl and the highest being 235 mg/dl.

This shows a decrease in total cholesterol levels between 4 mg/dl to 65 mg/dl. This result was strengthened by the test results of differences in total cholesterol levels before and after the CDMP intervention in the intervention group and in the control group using the paired sample T-Test, with statistical test results obtained p-value (0.000)

<0.005, which means there is a difference in the average mean total cholesterol levels before and after CDMP intervention for both group.

Analyzing Differences in Total Cholesterol Levels after Intervention in the Intervention Group and Control Group at Offshore Workers in Indonesian HE Companies

Table 3. Post test cholesterol levels in the intervention group and control group

Value	Total Cholesterol Level Post test		Differences in Cholesterol Levels
	Intervention Group	Control Group	
Value Min.	165	176	2
Value Max.	204	235	45
Mean	186	201	15
Median	187	199	10

Based on Table 3, it is known that the average post-intervention total cholesterol level in the intervention group was 186 mg/dl, with the lowest value being 165 mg/dl and the highest value being 204 mg/dl. In the control group, the average value was 201 mg/dl, with the lowest cholesterol level being 176 mg/dl and highest cholesterol level 235 mg/dl. This shows that there was a decrease in total cholesterol levels by 2 mg/dl to 45 mg/dl compared to the control group. The effect of the CDMP intervention on the intervention group is explained in the following table

Table 4. Analysis of the effect of CDMP intervention to cholesterol levels

Cholesterol Levels	N	Mean	±SD	Median	Value Min	Value Max	*p*- value
Intervention group posttest	30	186	10.4	187	165	204	0.000
Control group Postest	30	201	13.9	199	176	235	

Based on Table 4, it was found that the median value for the intervention group post test was 187 mg/dl with a standard deviation of ±10.4, while for the Control group post test the median value was 199 mg/dl with a standard deviation of ± 13.9. The independent sample T-Test obtained p- value 0.000 (<0.05), so there is different of result test after CDMP intervention between both groups.

The Effectiveness of Chronic Diseases Management Program to Hypercholesterol Diseases

Table 5. Results of effectiveness analysis of the intervention group and control group

Responden	Intervention Group		Control Group	
	N-Gain Score	Remark	N-Gain Score	Remak
Mean	71 %		40 %	
Value Min	42%		9%	
Value Max	100 %		84%	
$\bar{x}$	71%	Effective enough	40%	Less of effectiveness
Value of Effectiveness	1.77			

Based on table 5, the results of the N-Gain test calculation show that the average N-Gain score for the intervention group is 71% with a minimum N-Gain score of 42% and a maximum of 100%. Meanwhile in the control group it was 40% with a minimum N-Gain score of 9% and a maximum of 84%, and a value of effectiveness is 1.77, which means there is a difference in effectiveness to reducing total cholesterol levels for the intervention group is more effective than the control group. It can be concluded that the CDMP intervention is more effective in accelerating the reduction in total cholesterol levels by 31%.

DISCUSSION

Description of Characteristics Respondent

The research results showed that the characteristics of the respondents were based on age. Both the intervention group and the control group were dominated by people aged more than 40 years. Age influences the risk factors for developing hypercholesterolemia with the highest incidence at the age of 30-40 years. Theory reveals that age factors influence blood cholesterol levels, in childhood, women have higher cholesterol values than men. Men show a significant decrease in cholesterol during adolescence, due to the influence of the hormone testosterone which increases during that time. Adult men over 20 years generally have higher cholesterol levels than women (11). After women reach menopause, they have higher cholesterol levels than men. This is caused by reduced activity of the hormone estrogen after women experience menopause. This is in line with Hastono's research showing that there is a relationship between BMI (p=0.0001, OR 1.870) and age (p=0.004, OR= 1.975) with total cholesterol levels. BMI, and age as risk factors that increase total cholesterol levels (12).

Cholesterol levels tend to increase and if it is not controlled properly, it will be dangerous for the body. Usually, if men are over 50 years old, their cholesterol levels are high (13). As we age, the body experiences physiological changes that can affect cholesterol levels. Changes that occur in the walls of blood vessels, for example arteries, are likely to shrink gradually over a long time, but the effects of this damage are clearly visible from middle age (25-40 years) to old age (40-60 years) (11).This damage to the arteries is due to the deposition of fat in the blood vessels, some of which occur quickly but also others which occur slowly so that they only appear in old age (14). Ages ≥40 years are susceptible to hypercholesterolemia because increasing age can cause the body's metabolism to naturally slow down. The increase in blood cholesterol levels with increasing age is associated with a decrease in the elimination of cholesterol as bile salts and a decrease in receptors that mediate the clearance process of plasma LDL (15).

The frequency distribution of respondents based on exercise habits (physical activity) shows that both groups are dominated by respondents who do not exercise enough. The trigger factor that can increase blood cholesterol levels is lack of physical activity or exercise. This has been proven by research conducted by Widiyono that there is a significant relationship between the level of physical activity and cholesterol levels in the blood (7). A person's lack of physical activity is a trigger factor that can increase blood cholesterol levels, especially LDL cholesterol. High cholesterol levels will cause more cholesterol to stick to the walls of blood vessels and cause the blood vessel cavity to narrow (16). Lack of physical activity is one of the causes of high blood pressure because it can increase cholesterol levels in the body. High cholesterol levels can be a risk factor for heart and blood vessel disease (17).

Controlling physical activity so that it can always be carried out is a very important factor in preventing an increase or high in cholesterol levels and blood pressure. Sport as a structured activity also has a planned function for physical performance. In general, the benefits of exercise are increasing the body's endurance, increasing brain capacity, minimizing stress and burning fat (18). Exercise is highly recommended, especially for people with high cholesterol, which has the effect of lowering cholesterol levels in the blood. Exercise has been shown to have a positive impact on the pathogenesis, symptomatology, and physical fitness of individuals, as well as lowering blood cholesterol levels (19). Another study conducted by Waloya stated that blood cholesterol levels are very significantly influenced by physical activity. Regular exercise can reduce cholesterol deposits in blood vessels and reduce weight. Exercise can increase HDL cholesterol levels and reduce LDL cholesterol and triglyceride levels. From the research results, it is known that the respondents did not have high cholesterol levels, which was possible due to the respondents' considerable physical activity (16).

Based on BMI (Body Mass Index) the distribution frequency, the intervention group were dominated by responden with normal BMI there were 17 people and the control group dominated by respondents who were overweight which risk of obesity with total 18 responden. Respondents with a BMI in the excessive category (overweight-obese) do not always have high cholesterol levels, on the contrary, high cholesterol levels are actually found in respondents with a normal BMI. The results of this research are in line with the research of Anoop Misra and Usha Shrivastava which showed that there was no relationship between obesity and increased cholesterol in South Asia (20), and Hutami's research on students at the Faculty of Medicine, Sultan Agung Islamic University which resulted in a weak relationship between BMI with cholesterol levels (21), and research by Nugraha stated that there was no significant relationship between BMI and cholesterol levels (24). High cholesterol is not always influenced by BMI or obesity, but can be influenced by other factors such as smoking, drug consumption, exercise, and food consumption (24). These other factors are what provide differences in the measurement results from this research However, the results of this study are not in line with Khan and Khaleel's research, that in the obese and non-obese groups, it was found that the obese group had significantly higher cholesterol levels than the non-obese group (22). In other research, it shows that there is a significant relationship between BMI and adolescent cholesterol levels with a correlation value of p = 0.0160. Increased cholesterol levels can be caused by risk factors experienced

by respondents, but this does not always occur because it is influenced by excessive BMI. The author assumes that it is not BMI that determines a person's cholesterol levels but rather the amount of physical activity that can influence cholesterol levels (23).

Diet is another factor that can cause increases and decreases in cholesterol levels. Total cholesterol levels can increase due to consumption of foods that contain lots of cholesterol. High cholesterol is not always influenced by being overweight, but is caused by other factors such as diet (25). These factors can cause an increase or vice versa, the cholesterol levels. Preventive behavior must be carried out to prevent an increase in cholesterol levels. Maintaining a good and correct lifestyle, one of which is by maintaining a diet, doing exercise and regularly checking your health is an early prevention that can be done.

Diet planning activities, controlling and measuring the average daily cholesterol requirements of respondents so that daily cholesterol requirements are no more than 300 mg/day, because consumption of foods high in fat, especially from animal sources, will increase total cholesterol levels. Based on Bekti's research, suggesting that a person's cholesterol levels are influenced by a diet that contains high levels of saturated fat, this research shows that there is a relationship between food consumption patterns that are high in cholesterol and saturated fat and total cholesterol levels (31).One factor that changes cholesterol levels is reducing regular intake of foods high in cholesterol and high in saturated fat. Recommendations for consuming cholesterol should not exceed 300 mg/dl per day. Eating foods high in cholesterol can cause a rapid increase in blood cholesterol. This condition causes the arteries to harden and block blood flow. In addition, high levels of Low Density Lipoprotein (LDL), facilitate the oxidation of LDL, causing oxidative stress (32).

Intake of fat nutrients that exceeds the body's needs has a very big influence on cholesterol because it can cause hypercholesterolemia. Saturated fat can be converted into cholesterol, thereby increasing blood cholesterol, especially LDL, by slowing down the breakdown process (catabolism). Saturated fat tends to stimulate the liver to produce cholesterol, thereby increasing cholesterol levels in the blood. A diet that contains a lot of saturated fat will increase cholesterol levels. According to Syarfaini's research, there is a relationship between eating behavior and cholesterol. Cholesterol is influenced by food which is a source of fat, increasing fat consumption by 100 mg/day can increase cholesterol by 2-3 mg/day (33). According to research by Yoeantafara & Martini, there is a relationship between eating behavior and cholesterol, foods high in fat will increase cholesterol and LDL levels (34). This is confirmed by Saputri & Novitasari's research, there is a relationship between high-fat eating behavior and increased cholesterol in the blood, the liver has control over cholesterol levels, if the liver has sufficient cholesterol levels, a mechanism will be implemented to stop taking LDL which influences the increase in cholesterol levels (35). Treatment efforts needed to control cholesterol in the blood include diet (eating management) by reducing the habit of choosing foods that contain fat.

In measuring stress using Form DASS 42, the data obtained from the intervention group was 22 people with normal categories and control group was 18 responden with normal categories, so both group were dominated by normal stress scale, that,s not inline with study by Mohsenipouya's findings in Iran which found that there was a significant relationship between lifestyle and stress, where poor lifestyle changes worsened the patient's condition physiologically which also had an impact on the patient's psychology (26).Various internal and external factors can contribute to coping strategies for stress. These include age, gender, beliefs, personality type, spirituality, and the severity of the disease condition. External causes also influence, such as family support, medical personnel, and economic conditions (27)**.**

Stress management accompanied by acceptance of one's condition can influence stress psychologically and biologically by modulating positive stress reactions. Good self-acceptance has the potential to give rise to positive perceptions, so that psychological stability can occur. This mechanism is the reason for the relationship between self-acceptance and regulation of blood cholesterol in hypercholesterolemia patients (28)**.**There are several limitations found in this research, especially in the stress variable, such as the relatively small sample size and narrow scope of the research area, the measurement of stress which is only unidimensional allows the omission of several aspects of stress, such as the length and strength of exposure to stress in hypercholesterolemia patients. This research only provides a snapshot of stress at a certain time, without repeated measurements, so the research results cannot construct a cause-and-effect relationship as is the case in longitudinal research. In this research was conducted by researchers regarding the stress scale, it is subjective because they only provide the DASS42 form, in filling it out, the respondent could be dishonest so that the results do not match theory.

To reducing stress, is by doing active regular activities such as regular aerobic exercise can be useful for managing stress, body weight and strengthening the heart and blood vessel system and lowering total cholesterol. The ability of HDL to get rid of blood cholesterol usually increases during physical activity, because exercise can increase HDL blood cholesterol by 20-30%. Exercise done regularly for 30 minutes at moderate intensity every day can significantly reduce total cholesterol, triglycerides and LDL cholesterol. The decrease in total cholesterol levels due to aerobic exercise is due to the use of fatty acids as an energy source. The use of fatty acids as an energy source

can reduce the opportunity for sterol core synthesis, so cholesterol cannot be formed in excess (29). During long periods of aerobic exercise. Release of epinephrine and norepinephrine by the adrenal medulla during activity.

These two hormones directly activate the lipase enzyme which causes the very fast breakdown of triglycerides (lipolysis process) and the mobilization of fatty acids out of fatty acids. Increased beta adrenoceptor-mediated lipolysis in fat cells, this causes the breakdown of triglycerides in fat cells into glycerol and free fatty acids, which are then delivered to the bloodstream (29).The concentration of free fatty acids in the blood of someone who is active can increase up to eight times. Then these fatty acids will be transferred into the muscles as an energy source resulting in a decrease in LDL (Low Density Lipoprotein), because the main raw material for LDL formation comes from TG (Triglycerides) (29).

The decrease in total cholesterol levels in the Samosir study which reported that moderate intensity aerobic exercise could reduce total cholesterol levels (29). Samosir's research where the average value of changes in blood cholesterol levels after doing exercise in the 4th week was 33.60+4.01 mg/dL, with a p-value of 0.000<0.05 with the conclusion that prolanis aerobic exercise had an effect on sufferers' blood cholesterol. hypertension (29).Mayuni said that prolanis aerobic exercise aims to include as much oxygen supply as possible. The benefits of exercise are that HDL-C levels increase and reduce LDL-C and lower blood pressure (30). Based on the research results from the paired t-test, the average value of blood cholesterol levels before prolanis aerobic exercise was 22.03 mg/dl and after prolanis aerobic exercise for 4 weeks there was a decrease to 190.43 mg/dl, where the average change in levels cholesterol is 33.6+ 4.01, with a p-value of 0.000<0.05, which means that prolanis aerobic exercise has an effect on blood cholesterol levels.

Prolanis affects body fat and blood cholesterol. This research is also in line with Handayani's research,that there was a difference in average total cholesterol before and after doing exercise. Gymnastics is a sport that has an effect on reducing blood cholesterol levels if done regularly and continuously (8). Regular exercise can have a positive impact on a person's fitness, increasing the ability to use oxygen and cardiac output, work efficiency of the heart muscle, increase the body's metabolism and muscle capacity. This exercise should be applied 2-3 times a week to help reduce cholesterol levels in the blood (8).

Health education interventions were carried out to measure the level of knowledge of respondents. A person's level of knowledge is one of the factors that influences cholesterol levels. This is proven by research conducted by Widiyono that knowledge has a significant relationship with a person's cholesterol levels and influences preventive actions that can be taken to control cholesterol (7). By getting the right information, it is hoped that you will be able to gain sufficient knowledge to be able to implement a healthy lifestyle and can reduce the risk of degenerative diseases, especially cholesterol and cardiovascular disease (36).Athiutama's research stated that a small percentage of respondents had good knowledge about cholesterol disease (37). Likewise, Jaya's research shows that public knowledge and awareness about high cholesterol and its treatment is still low (38). Improving the lack of public knowledge can be done by providing information through implementing health promotion programs that can effectively increase awareness about high cholesterol and its treatment. Likewise, Renityas' research shows that health education about cholesterol is effective in increasing knowledge in preventing cholesterol (36).

CONCLUSION

The characteristics of respondents based on age is both group were dominated by people aged more than 40 years, for distribution frequency of respondents based on exercise habits (Physical Activity), both groups were dominated by respondents who did not exercise enough. Based on BMI (Body Mass Index) the distribution frequency, the intervention group were dominated by responden with normal BMI there were 17 people and the control group was dominated by respondents who were overweight which risk of obesity with total 18 responden . In measuring stress using Form DASS 42, the data obtained from the intervention group was 22 people with normal categories and control group was 18 responden with normal categories, so both group were dominated by normal stress scale. The results of the study showed differences in total cholesterol levels before and after the CDMP intervention in the intervention group (p-value=0.000) and the control group (p-value=0.000). The results of different test after CDMP intervention between both groups showed (p-value=0.000), The N-Gain score for the intervention group was 71% and for the control group was 40%, so the effectiveness of CDMP intervention on reducing total cholesterol by by 31%. The CDMP intervention was quite effective in reducing total cholesterol levels in the intervention group compared to the control group by 31%. It is recommended for hypercholesterol's person to carry out CDMP intervention through controlling aerobic exercise, diet planning, and regular health education.

SUGGESTION

This intervention needs to be implemented to control the incidence of hypercholesterolemia in offshore facility of Indonesian HE companies. Maintain a balance in consuming foods high in fat, and continue regular health education on other health topics, and should always consider other factors that can influence total cholesterol levels,

such as work fatigue, sleep patterns, or underlying diseases**.** So it is necessary to consider controlling factors such as work fatigue, sleep patterns or underlying diseases, as well as carrying out more complete examinations such as: LDL, HDL and Triglyceride levels. It is hoped that this will help obtain a clearer picture of the impact of CDMP intervention**s.**

REFERENCES

1. Lestari K. The Effect Of Aloe Vera Decoction On Blood Cholesterol Levels Of Obese Respondents Level I. JPK : Jurnal Proteksi Kesehatan. 2020;9(1):30–6.
2. Setianingsih N, Nahdiyah N, Purnamasari R, Biologi P, Sains F, Teknologi D, et al. Pengaruh Ekstrak Buah Pisang dan Ekstra Buah Alpukat terhadap kadar kolesterol dan Berat Badan Mencit Betina. Vol. 3, Jurnal Biota. 2017.
3. Saraswati SY, Puspitasari E, Yuwastiningsih E. Kadar Kolesterol Total Pada Perokok Aktif Dan Perokok Pasif. Journal Teknologi Laboratorium. 2020;5(2):1–62.
4. Syamsuddin F, Ayuba A, Jakaria SN. Kadar Kolesterol Dengan Kejadian Stroke Berulang Di Rsud Prof. Dr. H. Aloeisaboe Kota Gorontalo Provinsi Gorontalo. Jurnal Ilmu Kesehatan. 2022;10(2):1153–62.
5. Amriani YA, Tuahatu JW. Jurnal Penelitian Sains. Jurnal Penelitian Sains. 2021;21(3):163–7.
6. Kemenkes RI. Hasil Riset Kesehatan Dasar Tahun 2018. Kementrian Kesehatan RI. 2018;53(9):1689–99.
7. Widiyono W, Aryani A, Herawati VD. Pemberian air rebusan daun salam (Syzygium polyanthum) dapat menurunkan kadar kolesterol pada lansia dengan hiperkolesterolemia. Holistik Jurnal Kesehatan. 2021;15(1):39–47.
8. Desi Handayani E, Rizona F, Studi Ilmu Keperawatan Fakultas Kedokteran Universitas Sriwijaya P. Seminar Nasional Keperawatan "Pemenuhan Kebutuhan Dasar dalam Perawatan Paliatif pada Era Normal Baru" Tahun 2020, pengaruh senam Ergonomis terhadap kadar kolesterol darah pada lanjut usia di panti Sosial Tresna werdha teratai Palembang. 2020.
9. Putri NA. Systematic Review: Faktor Pengaruh Kadar Kolesterol Total Pada Pasien Obesitas Di Indonesia. 2020;
10. Permatasari O, Muhlishoh A. Pendidikan Kesehatan tentang asupan diet rendah lemak dan kolesterol di wilayah di Puskesmas Gambirsari Surakarta. 2020.
11. Ujiani S. Hubungan Antara Usia Dan Jenis Kelamin Dengan Kadar Kolesterol Penderita Obesitas RSUD Abdul Moeloek Provinsi Lampung. Jurnal Kesehatan. 2015;
12. Hastono SP. Indeks Masa Tubuh , Usia dan Peningkatan Kolesterol Total. Jurnal Kesehatan. 2020;13(1):44–5.
13. Rosyidi M. Hubungan Antara Lama Mengonsumsi Kopi Dengan Kadar Kolesterol. [Surabaya]: Universitas Muhammadiyah Surabaya; 2018.
14. Andika M. Pengaruh Konsumsi Susu Kedelai Terhadap Kolestrol Total Pada Penderita Hiperkolesterolemia Di Wilayah Kerja Puskesmas Lubuk Buaya Padang. Menara ilmu. 2019;XIII(3):99–105.
15. Maulidina1 PA, Ketut N, Sulendri S, Sofiyatin R, Wahyuningsih R, Gizi J, et al. Pengaruh Pemberian Juice Campuran Buah Naga (Hylocereus Polyrhizus) dan Sari Kedelai (Glycine Max) terhadap Kadar Kolesterol pada Pasien. SjnPoltekkes-MataramId [Internet]. 2022;1(1):18–25. Available from: https://sjn.poltekkes-mataram.id/index.php/home/article/view/5
16. Waloya T, Nuri Andarwulan dan. Hubungan Antara Konsumsi Pangan dan Aktivitas Fisik dengan Kadar Kolsterol Darah Pria dan Wanita Dewasa di Bogor (Association between Food Consumption and Physical Activity with Blood Cholesterol Levels of Adult Men and Women in Bogor). 2013.
17. Maryati H. Hubungan kadar kolesterol dengan tekanan darah penderita Hipertensi di Dusun Sidomulyo Desa Rejo Agung Kecamatan Ploso Kabupaten Jombang The Correlation of Cholesterol levels with Blood Pressure Hypertension Patients in Sidomulyo Rejoagung Village District Ploso Jombang. 2017;8(2). Available from: http://ejournal.umm.ac.id/index.php/keperawatan/issue/view
18. Sandi N. Sumber dan Metabolisme Energi dalam Olahraga. Universitas PGRI mahadewa Indonesia. 2019;5(2):64–73.
19. Mann S, Beedie C, Jimenez A. Differential Effects of Aerobic Exercise, Resistance Training and Combined Exercise Modalities on Cholesterol and the Lipid Profile: Review, Synthesis and Recommendations. Sports Medicine. 2014 Feb 31;44(2):211–21.
20. Misra A SU. Obesity and dyslipidemia in South Asians. Nutrients . 2013;7(33):5–7.
21. Hutami AT RWH. Hubungan Antara Indeks Massa Tubuh dengan Kadar Kolesterol (Studi Observasional Analitik Pada Mahasiswa Fakultas Kedokteran Universitas Islam Sultan Agung Angkatan. Pros Konf Ilm Mhs Unissula. 2019;11(6).
22. Khan MN KM. Comparative Study of Serum Lipid Profile of Obese and Non-Obese Students (Male) of

Aljouf University. Int J Biomed Adv Res. 2016;1(35):31–7.
23. Yusuf RN I. Hubungan Indeks Massa Tubuh (IMT) dengan Kadar Kolesterol Pada Remaja. Kesehat Saintika Meditory. 2019;1(2):50–6.
24. Nugraha A. Hubungan Indeks Massa Tubuh dengan Kadar Kolesterol Total pada Guru dan Karyawan SMA Muhammadiyah 1 dan 2 Surakarta. [Surakarta]: Universitas Muhammadiyah Surakarta; 2014.
25. Endang N RADA. Faktor Risiko Obesitas pada Orang Dewasa Urban dan Rural Obesity Risk Factors in Urban and Rural Adults. Kesehat Masy Nas. 2015;1(5):29–34.
26. Mohsenipouya H, Majlessi F, Shojaeizadeh D, Rahimi Foroushani A, Ghafari R, Habibi V, et al. Health-related variables and predictors of Health-promoting Lifestyle in cardiovascular disease patients. Electron Physician. 2016 Apr 25;8(4):2274–80.
27. Sadikin LM, & SE. Coping stres pada penderita diabetes melitus pasca amputasi. Jurnal Psikologi Klinis Dan Kesehatan Mental. Psikologi Klinis Dan Kesehatan Mental. 2013;2(3):17–23.
28. Amir F, Zahriyah, Priyanto A. Self acceptance , Stres Psikologis, Kadar Kolesterol, Hiperkolesterolemia C. Nursing Update. 2021;12 (3):148–55.
29. Samosir AS. Pengaruh senam aerobik dan suplementasi bawang putih terhadap penurunan kadar kolesterol total dan trigliserida wanita penderita obesitas. Jurnal Ilmiah Ilmu Keolaharagaan. 2020;
30. Mayuni. Senam lansia menurunkan tekanan darah lansia. Politeknik Kesehatan Denpasar. 2013;
31. Bekti HS, Suwarriana INA, Arjani IAMS. Peningkatan Kadar Kolesterol Pada Lansia Di Pedesaan Mengwi: Studi Deskriptif Cross-Sectional. Jurnal Pendidikan Kesehatan. 2022;11(2):97.
32. Muqowwiyah LZ, Dewi RK. Potensi Ekstrak Daun Alpukat sebagai Anti Kolesterol. Jurnal Tadris IPA Indonesia. 2021;1(3):403–12.
33. Syarfaini IAIY. Hubungan Pola Makan dan Aktivitas Fisik Terhadap Kadar Kolesterol pada Aparatur Sipil Negara. Jurnal Kesehatan. 2020;13(1).
34. Yoeantafara A, Martini S. Alodiea Yoeantafara : Pengaruh Pola Makan terhadap Kadar Kolesterol Total. 2017.
35. Saputri DA, Novitasari A, Biologi P, Raden U, Lampung I. Hubungan usia dengan kadar kolesterol masyarakat di kota bandar lampung. BIOEDUKASI. 2021;12(2).
36. Nevy Norma Renityas. Pendidikan Kesehatan Tentang Kolesterol Efektif Meningkatkan Pengetahuan Lansia Dalam Pencegahan Kolesterol. Jurnal Penelitian Kesehatan. 2019;9:82–8.
37. Athiutama A, Erman I, Febriani I, Agustin I, Keperawatan J, Kemenkes Palembang P. Edukasi Masyarakat Tentang Bahaya Kolesterol dan Pemanfaatan Senam Kolesterol. 2023;4(2):435–42. Available from: https://madaniya.pustaka.my.id/journals/contents/article/view/408
38. Jaya S, Lim H, Surjani L. Hubungan kolesterol total dengan tekanan darah pada pasien hipertensi diatas usia 40 tahun. Jurnal Kedokteran Methodist [Internet]. 2019;12(2):8–13. Available from: https://ejurnal.methodist.ac.id/index.php/jkm/article/view/666