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UTILIZATION OF FISH OIL TO REDUCE THE RISK OF CARDIOVASCULAR DISEASE

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ABSTRACT

Introduction: Omega-3 fatty acids are found in fish oil. Omega-3 fatty acids play a role in the primary and secondary prevention of cardiovascular disease. Cardiovascular disease (CVD) is the leading cause of death in both developed and developing countries. Cardiovascular is a disease group that includes coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease, rheumatic heart disease, deep vein thrombosis, and pulmonary embolism. **Purpose**: This systematic review aims to identify the prevention of cardiovascular events using fish oil. **Methods**: This journal was obtained from the Google Scholar, Pubmed, and Science Direct databases, which then extracted the data by looking at all the selected publication articles. **Results**: This reviewed journal shows the beneficial effects of fish oil in reducing mortality from cardiovascular disease. Omega-3s show benefits for preventing cardiovascular disease because omega-3s can reduce blood platelets and thus prevent the clogging of arteries. **Discussion**: Arterial blood vessels are at risk of obstructing blood flow to the heart. **Conclusion:** Thus, it can be concluded that fish oil can reduce the risk of cardiovascular disease.

Keywords: fish oil, cardiovascular.

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INTRODUCTION

Cardiovascular disease or heart disease generally refers to the condition of narrowing or blocking of blood vessels. This can cause a heart attack, chest pain (angina), or stroke. Other heart conditions that affect the valve or rhythm, the heart muscle, are also considered forms of heart disease. According to the American Heart Association (2017) in Oliver (2013), Cardiovascular disease causes the death of 17.3 million people in the world, of which about 3 million deaths occur before the age of 60 years. According to world statistics, 9.4 million deaths each year are caused by cardiovascular disease (CVD) and 45% of these deaths are due to coronary heart disease. It is estimated that the death rate will increase to 23.3 million in 2030 (Lestari, 2014).

Cardiovascular disease (CVD) is a term for a range of disorders affecting the heart and blood vessels, including cerebrovascular disease, coronary heart disease (CHD), hypertension, and peripheral vascular disease (PVD). The definition of cardiovascular also concerns other diseases such as rheumatic heart disease (heart damage due to rheumatism) and congenital heart disease (damage to the structure of the heart from birth) (Guilherme and Kalil, 2016).

Heart disease is the number one cause of death globally and most people die every year due to heart disease rather than other causes (WHO, 2011). More than 4.5 million deaths each year are caused by coronary heart disease in developing countries (WHO, 2012). Meanwhile, according to the World Health Organization (WHO), in 2016, coronary heart disease caused more than 7.4 million deaths in the world. By 2030, it is estimated that nearly 23.6 million people will die from cardiovascular disease, especially heart disease and stroke (WHO, 2016).

The prevalence of coronary heart disease based on data from Basic Health Research

(Riskesdas) in 2013 shows that the prevalence of coronary heart disease in Indonesia according to doctor's diagnosis is 0.5% or around 883,447 people, while based on doctor's diagnosis and existing symptoms is 1.5% or around 2,650,340 people. Judging from the data, the provinces in Indonesia that have the highest prevalence of coronary heart disease are West Java with 160,812 people (0.5%) and the prevalence of coronary heart disease based on diagnosis and the presence of the most symptoms in East Java province with 375,127 people (1, 3%). West Sumatra was in the 4th highest heart disease prevalence position in Indonesia in 2009.

The main factors causing heart attacks include three things, namely heavy smoking, hypertension, and cholesterol. Supporting factors causing heart attacks include obesity, diabetes, lack of exercise, genetics, stress, personality type, oral contraceptive pills, and gout (Payne, 1995). The American Heart Association (AHA) explains that risk factors can be divided into three major categories: major risk factors such as hypertension, abnormal blood cholesterol, and smoking. Indirect risk factors (contributing risk factors) such as obesity, diabetes mellitus, inactivity, and stress. Natural risk factors such as age, heredity, and gender (Soeharto, 2001).

Coronary heart disease (CHD) is still an important health problem and has a socio-economic impact due to the long duration of treatment and treatment, the cost of drugs which are quite expensive, and other supporting examinations required in the treatment process. Prevention efforts by early detection of risk factors and efforts to control them are very important (Lannywati, et al. 2016). One of the preventive efforts against cardiovascular disease is by consuming fish oil. Omega-3 fatty acids widely found in fish oil provide pleiotropic cardiometabolic effects, which largely benefit the cardiovascular system. Omega-3s show benefits for preventing cardiovascular disease because omega-3s can reduce blood platelets, thereby preventing the clogging of arteries (Koromhout, 2011).

A previous study conducted the DART study, published in 1989, the first randomized trial to demonstrate the efficacy of fish oil in coronary artery disease (CAD) (Majmudar MD, et al, 2009). In that trial, 2,033 post-MI (post-myocardial infarction) patients were randomized to receive 3 diets: a diet high in cereal fiber, polyunsaturated fat, or fish oil (Burr ML, et al, 1989). The fish oil group consumed 200 to 400 g per week of fatty fish (2 servings of fish per week) or 0.5 g per day of fish oil supplements (Burr M., 2007). At 2 years, the main endpoint of all causes of death was reduced by 29% in the fish oil group, whereas no improvement was seen in the other dietary advice group (Burr M., 2001). The Lyon Diet Heart Study, conducted shortly after the DART study, The Lyon Diet Heart Study is a prospective trial of 607 MI survivors randomized to a Mediterranean diet or a regular western diet. At a median follow-up of 27 months, the main endpoints of death from cardiovascular causes and nonfatal mortality had a 73% reduction in relative risk - a positive effect that continued on the mean follow-up assessment at 46 months (De Lorgeril M, et al., 1994).

Since 1992 heart disease has become the number one killer disease in Indonesia, and what is more concerning is that it also affects the population of productive age. The results of a survey by the Ministry of Health stated that heart disease sufferers had reached 160 people per 100,000 people. This equilibrium figure is quite high and alarming (Harian Republika, 4 October 1993). Seeing the fact that heart disease sufferers are quite high, a systematic review was made and its relation to fish oil so that later a solution can be found to reduce the risk of cardiovascular disease. In this regard, a systematic review aims to identify the prevention of cardiovascular events using fish oil.

METHOD

The model used in this study is a systematic review. The steps in this study are summarized in Figure 1. The articles in this study were obtained from electronic databases published on Google Scholar, ScienceDirect, and PubMed. The structure of the keywords used for the literature search was "fish oil" AND "omega 3" AND "cardiovascular". The criteria in this study are articles published no more than 10 years, in English or Indonesian, available in full-text form, research articles, and containing discussion of the effects of omega-3s on fish oil in preventing cardiovascular disease.

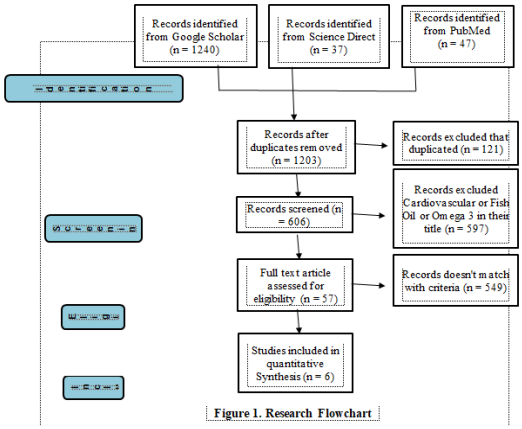

Figure 1. Research Flowchart

The number of articles obtained from Google Scholar is 1,240 articles, PubMed 47, and Science Direct is 37. Articles published more than once and published by Google Scholar, PubMed, and Science Direct are tagged. After searching for articles that covered the criteria, only 1203 articles were eligible. The screening was continued again by looking at titles that did not include the words "Cardiovascular or Fish Oil or Omega 3", so that there were 606 articles and after reviewing the complete articles, the final articles were 57 articles. After double-checking, we read the abstracts of each article to see the relevance of the articles to the topics covered in this systematic review. The result found 6 articles that qualify for use in the systematic review.

RESULT

A DART study in 1998 demonstrated the efficacy of fish oil in coronary artery disease (CAD). To prove the effectiveness of this study, research has been carried out in the article "Fish oil and omega-3 fatty acids in cardiovascular disease: do they really work?" compiled by Daan Kromhout, et al. 2012 showed that the incidence of fatal CAD was 17% lower among those who ate less than twice a week compared to those who ate little or no fish. It can be concluded that omega-3 fatty acids exert a pleiotropic, cardiometabolic effect with various actions, most of which benefit the cardiovascular system.

Several other studies also support this fact, one of which is in the research article "Fish Consumption, Fish Oil, Omega-3 Fatty Acids, and Cardiovascular Disease" written by Penny M. Kris-Etherton, et al. demonstrated that EPA DHA supplementation ranging from 0.5 to 1.8 g / day (either as fatty fish or a supplement) significantly reduced cardiac mortality and all subsequent causes.

Furthermore, in the research article "Fish oil and cardiovascular disease: lipids and arterial function" written by Paul J Nestel. This research proves that fish oil can reduce the risk of cardiovascular disease in someone who has it. Then finally, the research article "Fish Oil for the Treatment of Cardiovascular Disease" compiled by Daniel Weitz, et al. in 2010 demonstrated that adding omega-3 FA to a healthy diet appears to be safe when used for primary and secondary prevention of CAD (coronary artery disease).

DISCUSSION

Cardiovascular disease is caused by malfunctioning of the heart. Globally, PTM (non-communicable disease) is the number one cause of death every year. Deaths caused by heart disease are around 4% in high-income countries to 42% in low-income countries (Martiningsih & Abdul H, 2019). The Health Research and Development Agency (Badan Litbangkes, 2013), through the results of Basic Health Research (Riskesdas) in 2013, confirmed that non-communicable diseases related to heart and blood vessel disease include hypertension, coronary heart disease, heart failure, and stroke. Any cardiovascular disease, namely coronary heart disease, stroke, or cerebrovascular disease (CVD), is mostly caused by an unhealthy lifestyle. Another factor that causes the cardiovascular disease is obesity. Someone who is obese will need more oxygen, which causes an increase in heart muscle work.

According to the Indonesian Ministry of Health (2014), cardiovascular disease sufferers in Indonesia will experience an increase. This condition will impose various burdens, namely illness, disability, and social and economic burdens on the sufferer's family, community, and state. The results of Riskesdas in 2013 showed that based on a doctor's diagnosis or symptoms, the prevalence of coronary heart disease was 1.5%, heart failure was 0.3%, while the prevalence of stroke was 57.9%. The prevalence based on doctor's diagnoses and symptoms of coronary heart disease was 1%, heart failure was 2%, and stroke was 9.6% in Banten Province (Litbangkes Agency, 2013). Meanwhile, according to Riskesdas in 2018, the prevalence of heart disease based on a doctor's diagnosis in Banten Province at all ages was 1.4% (Litbangkes Agency, 2018).

The Indonesian government has started to pay more attention to cardiovascular disease. This is evidenced by the enactment of the Regulation of the Minister of Health of the Republic of Indonesia Number 1575 of 2005 concerning the Organizational Structure of the Ministry of

Health of the Republic of Indonesia which has established the Directorate of Non-Communicable Disease Control (PPTM). The PPTM Directorate is divided into 5 Sub-Directorate, namely: 1) Guidelines for the Control of Heart and Blood Vessels, 2) Diabetes Mellitus and Metabolic Diseases Sub-Directorate, 3) Cancer Sub-Directorate, 4) Chronic and Degenerative Diseases Sub-Directorate, and 5) Sub-Directorate for Accident and Injury Disorders effective February 8, 2006, (Kemenkes RI, 2010).

According to research, fish oil can reduce deaths from cardiovascular disease. Good quality fish oil is rich in fatty acids. Omega-3s are one of the unsaturated fatty acids that are essential for the body and are especially needed for people with high cholesterol. EPA and DHA are the most dominant types of omega-3 in fish oil (Haris, 2004). Supplementation with EPA and DHA can exert a protective effect on the heart by increasing mitochondrial function and the efficiency of ATP formation. A study conducted by Whelton and colleagues found the incidence of fatal CAD was 17% lower among those who ate fish less than twice a week than those who ate little or no fish (Whelton SP, He J, Whelton PK, Muntner P., 2004). The same results were found by He and his friends for fish consumed once a week. He observed a dose-response relationship between fish consumption and CAD mortality and individuals who consumed five or more times per week had a 38% lower risk of fatal CAD (He K, Song Y, Daviglus ML, Liu K, Van Horn L, Dyer AR., Greenland P., 2004). Another study conducted by Brouwer and colleagues stated that experiments that have been carried out using fish oil capsules containing 0.9-2.8 g of EPA-DHA showed a significant reduction of 20% in cardiac death (Brouwer IA, et al., 2009). He observed a dose-response relationship between fish consumption and CAD mortality and individuals who consumed five or more times per week had a 38% lower risk of fatal CAD (He K, Song Y, Daviglus ML, Liu K, Van Horn L, Dyer AR., Greenland P., 2004). Another study conducted by Brouwer and colleagues stated that from experiments that have been carried out using fish oil capsules containing 0.9-2.8 g of EPA-DHA showed a significant reduction of 20% in cardiac death (Brouwer IA, et al., 2009) He observed a dose-response relationship between fish consumption and CAD mortality and individuals who consumed five or more times per week had a 38% lower risk of fatal CAD (He K, Song Y, Daviglus ML, Liu K, Van Horn L, Dyer AR. , Greenland P., 2004). Another study conducted by Brouwer and colleagues, stated that from experiments that have been carried out using fish oil capsules containing 0.9-2.8 g of EPA-DHA showed a significant reduction of 20% in cardiac death (Brouwer IA, et al., 2009)

The results of a systematic review of the six journals prove fish oil can reduce the risk of cardiovascular disease in someone who has it. This is evidenced by research that shows that the content in fish oil in the form of high levels of omega-3 FA, eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) can reduce serum triglyceride levels by modulating very low-density lipoproteins (VLDL) and chylomicron metabolism. Long-term consumption of EPA and DHA has been shown to positively impact coronary heart disease, which is to reduce the risk of sudden death by up to 45% compared to patients who do not consume EPA and DHA (Haris, 2004). EPA and DHA are also beneficial in relieving keloid symptoms (Olaitan et al., 2011), lowering cholesterol in the blood, especially LDL, anti-platelet aggregation, and anti-inflammatory (Haris, 2004). A study conducted by Daniel Weitz, et al., Showed that adding omega-3 FA to a healthy diet appears to be safe when used for primary and secondary prevention of CAD (coronary artery disease). A study conducted by Penny M. Kris-Etheron, PhD, showed that omega-fatty acids have been tested epidemiologically and clinically to reduce CVD incidence. Although it is beneficial and has various benefits for the human body, it seems that excess doses of fish oil can also be dangerous. Some of the side effects that can arise include an increased risk of bleeding. demonstrated that adding omega-3 FA to a healthy diet appears to be safe when used for primary and secondary prevention of CAD (coronary artery disease). A study conducted by Penny M. Kris-Etheron, PhD, showed that omega-fatty acids have been tested epidemiologically and clinically to reduce CVD incidence. Although it is beneficial and has various benefits for the human body, it seems that excess doses of fish oil can also be dangerous. Some of the side effects that can arise include an increased risk of bleeding. demonstrated that adding omega-3 FA to a healthy diet appears to be safe when used for primary and secondary prevention of CAD (coronary artery disease). A study conducted by Penny M. Kris-Etheron, PhD, showed that omega-fatty acids have been tested

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Fish oil can be used as a solution for people with cardiovascular disease. Omega-3 fatty acids can prevent cardiovascular disease (Nettleton, 2005). Research shows that consumption of 4 g / day of omega-3 fatty acids from fish oil can reduce serum triglyceride concentrations by 25% -30% accompanied by an increase in LDL by 5% -10% and HDL by 1% -3% (Harris WS in Grace Fonda, 2016). Fish oil has a therapeutic effect in conditions of severe hypertriglyceridemia (more than 750 mg / dL). Effective omega-3 dosages range from 3-5 grams per day with consistent supplementation. It is currently found that EPA and DHA have the effect of reducing triglyceride levels (Grimsgaard S in Grace Fonda, 2016). Omega-3 in fish oil is increasingly proven to prevent cardiovascular disease, supported by placebo-controlled trials in Italy. The placebo test showed a slight reduction in the risk of CHD mortality and the number of hospitalizations for cardiovascular reasons in 3,494 patients who took 1 gram of omega-3 supplements per day for an average of 3.9 years (Tavazzi L in Grace Fonda, 2016). Based on the results of journal reviews, eight journals explained that omega-3s found in fish oil could reduce the risk of cardiovascular disease. 9 years (Tavazzi L in Grace Fonda, 2016). Based on the results of journal reviews, eight journals explained that omega-3s found in fish oil could reduce the risk of cardiovascular disease. 9 years (Tavazzi L in Grace Fonda, 2016). Based on the results of journal reviews, eight journals explained that omega-3s found in fish oil could reduce the risk of cardiovascular disease.

CONCLUSION

Cardiovascular is a disease group that includes coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease, rheumatic heart disease, deep vein thrombosis, and pulmonary embolism. Cardiovascular disease (CVD) is the leading cause of death in both developed and developing countries. Fish oil contains nutrients that are beneficial to the body, one of the nutrients in fish oil is omega-3. Omega-3s show benefits for preventing cardiovascular disease because omega-3s can reduce blood platelets and thus prevent the clogging of arteries. Arterial blood vessels are at risk of obstructing blood flow to the heart. Based on a systematic review, omega-3 fatty acids have been shown to reduce the incidence of cardiovascular disease (CVD). Therefore,

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Table 1 Literature Review

Title	Author	Method	Respondents /Sample	Research Place	Result	Conclusion
Prevention of Fatal Arrhythmias in High-Risk Subjects by Fish Oil n-3 Fatty Acid Intake	Alexander Leaf, MD; Christine M. Albert, MD, MPH; Mark Josephson, MD; David Steinhaus, MD; Jeffrey Kluger, MD; Jing X. Kang, MD, PhD; Benjamin Cox, BS; Hui Zhang, PhD; David Schoenfeld, PhD	The experimental method is a randomized controlled study with a double-blind design	Four hundred and two patients with implanted cardioverter/defibrillator (ICDs)	Massachusetts General Hospital, USA	Of the 402 patients enrolled at 18 centers in the US. The two treatment groups were particularly suitable for clinical characteristics. - in the first treatment analysis (all those who had taken fish oil supplements), the relative risk was 0.73. - in a limited second treatment analysis (only in subjects adhering to fish oil), the relative risk was 0.62.	The results show that fish oil can be an alternative anti-arrhythmic drug to reduce ventricular sustainability (VT) / ventricular fibrillation (VF) in ICD (implantable cardioverter) patients.
Fish oil and omega-3 fatty acids in cardiovascular disease: do they really work?	Daan Kromhout, Satoshi Yasuda, Johanna M. Geleijnse, and Hiroaki Shimokawa	Journal review methods from other researchers.	Fish oil.	Japan	- the Whelton study showed a 17% lower incidence of fatal CAD among those who ate less than twice a week compared with those who ate little or no fish. - Observational studies show the protective effect of fish consumption on heart attacks. - randomized trial studies show that diets with higher amounts	Omega-3 fatty acids provide pleiotropic and cardiometabolic effects with various actions, most of which benefit the cardiovascular system.

					of omega-3 fatty acids or supplementing with omega-3 fatty acids reduce cardiovascular mortality. Nb: CAD (Coronary Artery Diseases)	
Fish Consumption, Fish Oil, Omega-3 Fatty Acids, and Cardiovascular Disease	Penny M. Kris-Etherton, PhD, RD; William S. Harris, PhD; Lawrence J. Appel, MD, MPH	Epidemiological and Observational Studies	11,324 patients with pre-existing coronary heart disease	Hospitals in the United States	Large-scale epidemiological studies show that individuals at risk of coronary heart disease benefit from consumption of omega-3 fatty acids of vegetable and marine origin. Evidence from prospective secondary preventive studies suggests that EPA DHA supplementation from 0.5 to 1.8 g / day (either as fatty fish or supplement) significantly reduces cardiac mortality and all subsequent causes.	Omega-3 fatty acids have been shown in epidemiological and clinical trials to reduce the incidence of CVD.
Fish oil and cardiovascular disease: lipids and arterial function	Paul J Nestel	Studies by collecting research data that have been conducted by previous researchers	Tanzanian villagers	Tanzania	Shows that when an equivalent amount of n 2 3 fatty acids (4 g / day) is eaten as fish or as fish oil, the cardiovascular risk is reduced.	Fish oil can reduce the risk of cardiovascular disease in someone who has it.
Cardiovascular Benefits of Fish-Oil Supplementation Against Fine Particulate Air Pollution in China	Zhijing Lin, PHD, Renjie Chen, PHD, Yixuan Jiang, BA, Yongjie Xia, PHD, Yue Niu,	randomized, double-blind, and placebo-controlled trials.	65 healthy students in Shanghai, China.	China	The mean PM2.5 level was 38 mg / m3 during the study period. Compared to the placebo group, the fish oil group showed relatively stable levels of most of the biological	This trial demonstrated that omega-3 fatty acid supplementation was associated with subclinical short-term cardiovascular benefits of PM2.5 exposure among healthy young

	PHD, Cuiping Wang, PHD, Cong Liu, PHD, Chen Chen, MS, Yihui Ge, MS, Weidong Wang, MS, Guanjin Yin, MS, Jing Cai, PHD, Viviane Clement, MS, Xiaohui Xu, PHD, Bo Chen, PHD, Honglei Chen, PHD, Haidong Kan, PHD.				markers in response to changes in PM2.5 exposure. Between groups the differences associated with PM2.5 exposure varied according to biomarkers and exposure lag. The authors observed the beneficial effects of fish oil supplementation on 5 biomarkers of blood inflammation, coagulation, endothelial function, oxidative stress, and neuroendocrine stress response in the fish oil group with a rate of spurious findings <0.05.	adults in China.
Fish Oil for the Treatment of Cardiovascular Disease	Daniel Weitz, MD, Howard Weintraub, MD, Edward Fisher, MD, and Arthur Z. Schwartzbard, MD	Exploration of other sources, discussion, examination of mechanisms and data boundaries.	Fish oil clinical use.	Department of Medicine, Leon H. Charney Division of Cardiology, NYU Langone Medical Center, New York.	Fish contains high levels of 2 omega-3 FA, eicosapentaenoic acid (EPA; C20: 5 n-3), and docosahexaenoic acid [DHA]; C22: 6 n-3). Omega-3 FA most likely reduces serum triglyceride levels by modulating very low-density lipoprotein (VLDL) and chylomicron metabolism. The hypotriglyceridemic effects of fish oil are well known and are related to the dose and level of baseline triglycerides. Patients with triglycerides <90 mg / dL will be slightly affected unless high doses of omega-3 FA are used.	Addition of omega-3 FA to a healthy diet appears to be safe when used for primary and secondary prevention of CAD (coronary artery disease). The potential benefits are not limited to reducing triglycerides. However, the added benefits of modern therapy and a prudent diet are not yet fully evaluated.