LITERATURE REVIEW
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Literature Review: The Role of Medium Chain-Triglyceride (MCT) in Improving Lipid Profiles in Dyslipidemia

Literature Review: Peran Medium Chain-Triglyceride (MCT) dalam Memperbaiki Profil Lipid pada Kondisi Dislipidemia

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ABSTRACT

Background: Dyslipidemia is a lipid metabolism disorder that causes changes in plasma lipoprotein function and/or levels of Triglycerides (TG), total cholesterol (TC), Low-Density Lipoprotein (LDL), and High-Density Lipoprotein (HDL). Administration of Medium Chain Triglyceride (MCT) is a non-pharmacological therapy that effectively improves lipid profiles and reduces the risk of dyslipidemia.
Objectives: This study aimed to conduct a literature study regarding the role of MCTs in improving lipid profiles in dyslipidemic conditions.
Discussion: MCT has a role in improving the lipid profile. One food source that contains MCT, which has a role in improving total blood cholesterol, TG, and LDL levels was Virgin Coconut Oil (VCO). About 60% of MCFA in VCO consists of 52% lauric acid and 12% myristic acid, which can benefit lipid metabolism. In addition, foods containing MCTs have a role in lowering blood cholesterol levels and reducing TG levels. Not only do they play a role in reducing total cholesterol, TG, and LDL levels, but MCTs also increase HDL concentrations.
Conclusions: MCTs have a role in improving lipid profiles in dyslipidemic conditions, namely by increasing HDL levels and lowering TG, total cholesterol, and LDL levels.

INTRODUCTION

Indonesia faces the triple burden of malnutrition, conditions/high prevalence of excess nutritional status (overweight and obesity), under nutrition status, and nutrient deficiencies[1]. Based on the 2018 Riskesdas results[2], there was an increase in the prevalence of obesity at the age of > 18 years from 14.8% to 21.8%. This increase in prevalence is in line with the causes of obesity, namely low physical activity, inadequate sleep, high levels of stress, and uncontrolled eating patterns, which lead to dyslipidemia[3]. This condition was proven by Sugeha et al.[4], where someone overweight has a 3.75 times risk of experiencing dyslipidemia (95% CI 1.257-4.357).

Dyslipidemia is a lipid metabolism disorder that causes changes in function and/or plasma lipoprotein levels of Low-Density Lipoprotein (LDL) and High-Density Lipoprotein (HDL)[5]. A person is categorized as having dyslipidemia when their triglyceride (TG) level is ≥150 mg/dL, HDL cholesterol is <40 mg/dL and LDL cholesterol is ≥100 mg/dL[6]. Riskesdas 2018[2], shows that in the Indonesian population aged 15 years and over, there are 21.2% have total cholesterol levels (TC) that are at the threshold, 24.3% have low HDL levels, 24.9% have direct LDL levels at the threshold, 13.3% had TG levels at the highest threshold.

Based on the guidelines for dyslipidemia management by the European Society of Cardiology (ESC) and the European Atherosclerosis Society (EAS)[7], therapy to overcome dyslipidemia can be done with pharmacological and non-pharmacological therapy. However, pharmacological therapy can cause side effects, including causing myopathy and liver toxicity in long-term use of Simvastatin, so non-pharmacological therapy is given, namely giving food supplements and consuming functional food[5]. A retrospective study showed that 3 out of 5 cases of dyslipidemia showed a significant improvement in lipid profile after two weeks with dietary therapy or MCT supplementation[8].

Medium Chain-Triglycerides(MCT) are fats with three chains of saturated fatty acids, each containing 6 to 10 carbon atoms[8]. MCT comes from extracting the dry fraction of Cocos nucifera L. endosperm or Elaeis guineensis Jacq dry endosperm[9]. MCT has a small molecular size with a liquid form at room temperature and a low melting point and has a lower energy content (8.4 kcal/g) compared to LCT (Long Chain Triglyceride), which has an energy content of 9.2 kcal/g g[10]. This

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condition causes MCT to be easily digested and absorbed by the body and can be a source of energy and not stored as fat. The results of a study by Sung et al.[11] explained that administration of a high-fat diet with MCT oil in type 2 DM rats could reduce LDL, non-esterified fatty acids, and liver TC levels, as well as increase HDL levels and the HDL/LDL ratio.

Meanwhile, the effect of giving a low-fat diet with MCT oil in type 2 DM rats was a lower body weight increase compared to mice with a high-fat diet with soybean oil. Another study conducted by Venty et al.[12] stated that administering Virgin Coconut Oil (VCO) to white Wistar rats receiving a high-cholesterol diet increased HDL levels and decreased LDL and TC levels influenced by the MCT content in VCO, which had the effect of suppressing lipogenesis. A study by Cardoso et al.[13], also mentioned administration of VCO which contains 60% MCT in patients with coronary artery disease, can have a significant HDL-increasing effect with no change in LDL and TG. Therefore, this literature review aims to determine the role of MCT in improving lipid profiles in dyslipidemic conditions.

METHODS

This research was a literature study with a literature review design. The data portals used were Google Scholar, Proquest, PubMed, and Science Direct. The keywords used were a combination of Medium Chain Triglyceride, MCT, HDL, LDL, TG, Cholesterol, Lipid Profile, Dyslipidemia, and MCFA using the Boolean Operators "AND" and "OR" (Table 1). The inclusion criteria of this study were based on the principles of PICOS (Population, Intervention, Compare, Outcome, Study design). The exclusion criteria from this study, namely research focusing on body composition and weight change, was because external factors, such as physical activity and lifestyle, also influence these conditions. The year of publication for scientific articles used in the last ten years (2011-2021). The sample population was experimental animals (rats) and human studies. The interventions provided were food sources of MCT, pure MCT, and Medium Chain Fatty Acid (MCFA). The results used in the literature study were the lipid profile. The research design used was a Randomized Controlled Trial (RCT). From the article search, 15 articles passed the selection based on inclusion and exclusion criteria so that they can be used as reference material in this literature review (Figure 1).

Table 1. Article search keyword

Databases	**Keywords**
Google Scholar, ProQuest	("Medium Chain Triglyceride" OR "MCT" OR "Medium Chain Fatty Acid" OR "MCFA") AND ("Lipid Profile" OR "High-Density Lipoprotein" OR "Low-Density Lipoprotein" OR "triglyceride" OR "total cholesterol" AND "dyslipidemia")
PubMed Central	("Medium Chain Triglyceride "[Title] OR " MCT "[Title] OR " Medium Chain Fatty Acid "[Title] OR “MCFA” [Title]) AND ("p Lipid Profile "[All Fields] OR "High-Density Lipoprotein "[All Fields] OR "Low-Density Lipoprotein "[All Fields] OR "triglyceride"[All Fields] OR ("total cholesterol "[All Fields]) AND ("dyslipidemia" [All Fields])
Science Direct	("Medium Chain Triglyceride" OR "Medium Chain Fatty Acid") AND ("Lipid Profile" OR "High-Density Lipoprotein" OR "Low-Density Lipoprotein" OR "triglyceride" OR "total cholesterol" AND "dyslipidemia")

DISCUSSIONS

Based on the 15 articles that have been collected, there were 11 articles with in vivo studies and human studies articles. As many as 90% of in vivo studies discussed the role of MCT on lipid profile, and 54% discussed the role of MCT on body weight and body composition. Meanwhile, four human study articles discuss the role of MCT on lipid profile (Tables 2 and 3).

MCT is a natural PPAR-α ligand in which PPAR-α activity enhances the enzyme *lipoprotein lipase* in the liver and skeletal muscles. This shows that MCT andPPAR-α is involved in lipid metabolism[12]. Several food sources containing MCT have a role in TC levels, including VCO and Etawa goat milk. This finding is evidenced by research conducted by Venty et al.[12] mice that received a high-cholesterol diet with the addition of VCO had a lower average TC level than mice that received a high-cholesterol diet without adding VCO. In addition, Putri et al.[17] stated in their research that etawa goat milk can lower blood cholesterol levels, where there was a 12.8% decrease in TC in the group of rats fed a diet of 3.51 mL/200 g BW of etawa goat milk and a decrease of 19.2% in the control group. Rats were fed Etawa goat's milk as much as 4.32 mL/200 g BW. Etawa goat milk contains MCT or MCFA, which are 35% more capric, caproic, lauric, and caprylic acids than cow's milk which contains 17%. From the two examples of these foodstuffs, it is known that they both contain MCT and MCFA, which are types of fat that contribute to lowering cholesterol in terms of their mechanism in the bodies of experimental animals. Based on research by Li et al.[8], male rats that received a high-cholesterol diet with the addition of MCT had lower TC levels than mice that received a high-cholesterol diet with the addition of LCT. This condition is because MCTs reduce rat serum cholesterol levels by increasing the excretion of bile acids in the liver while reducing the reabsorption of bile acids in the small intestine, thus facilitating the elimination of excess cholesterol in the body.

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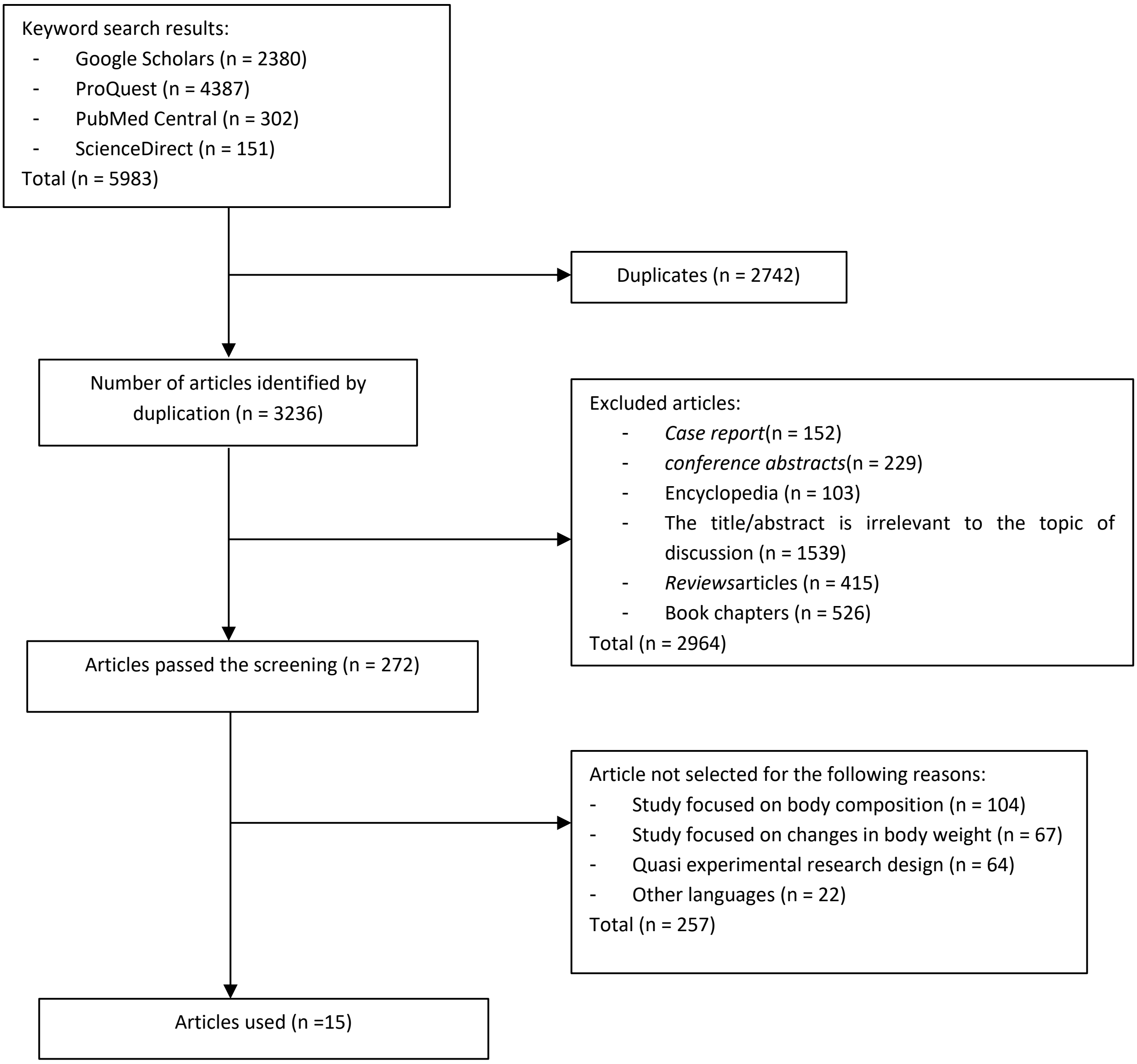

Figure 1. Prisma flowchart

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Table 2. Summary of in vivo study literature

Reference	Design	Duration	Control	Intervention	Results
Li et al., 2018[8]	*Randomized Controlled Trial*	16 weeks	12 randomized male rats were given a high cholesterol diet (1% cholesterol) 12 randomized male rats were given a high cholesterol diet + LCT (1% cholesterol + 1% LCT)	12 randomized male rats were given a high cholesterol diet + MCT (1% cholesterol + 2% MCT)	1. The group that received the high cholesterol + MCT diet had lower body weight, TC, and total LDL than those that received the high cholesterol + LCT diet. 2. The group that received a high-cholesterol diet + MCT had a higher HDL/LDL ratio than the group that received a high-cholesterol diet + LCT ($p < 0.05$).
Geng et al., 2016[14]	*Randomized Controlled Trial*	11 weeks	8 randomized male rats were given a normal diet based on the composition of a standard diet for rodents, namely AIN-76 with 5% corn oil content 8 randomized male rats were given a high-fat control diet (17% lard + 3% corn oil)	8 randomized male rats were given a high isocaloric fat diet + MCT (17% MCT + 3% corn oil)	1. Mice fed the MCT diet showed significantly less weight gain (−44%) and lower final body weight (−15%) without affecting their food intake than mice fed a high-fat diet.
Sung et al., 2018[11]	*Randomized Controlled Trial*	8 weeks	8 randomized male rats (DM) were given a low-fat diet with soybean oil (70 g soybean oil (16% fat)) 8 randomized male rats (DM) were given a high-fat diet with soybean oil (254.4 g soybean oil (58% fat)	8 randomized male rats (DM) were given a low-fat diet with MCT (35 g soybean oil (8% fat) + 38 g MCT oil (8% fat)) 8 randomized male rats (DM) were given a high-fat diet with MCT (127.2 g soybean oil (29% fat) + 137.9 g MCT oil (29% fat))	1. The body weight of the DM rats that consumed a high-fat diet with soybean oil was significantly higher than the DM rats that consumed a low-fat diet with MCT ($p < 0.05$). 2. The group that received a low-fat diet (with soybean oil or MCT) had significantly lower liver TG levels than the group that received a high-fat diet (with soybean oil or MCT) ($p < 0.05$). 3. The LDL serum concentration of the high-fat diet with the soybean oil group was significantly higher than the other three groups ($p < 0.05$), and the high-fat diet with the soybean oil group had higher LDL than the high-fat group with MCT ($p < 0.05$). 05). 4. The high-fat diet group with soy had lower HDL concentrations than those with MCTs. 5. The MCT diet group (low and high fat) had significantly higher HDL values than the soybean oil diet group (low and high fat). The HDL/LDL ratio in the high-fat diet group with MCT was significantly higher than in the high-fat diet group with soybean oil ($p < 0.05$).
Zhang et al., 2015[15]	*Randomized Controlled Trial*	12 weeks	15 randomized male (obese) rats were given a high-fat diet containing 2% LCT	15 randomized male (obese) rats were given a high-fat diet containing 2% MCT	1. The MCT group's TG, TC, and LDL decreased significantly, while blood HDL and HDL/LDL ratios increased markedly.

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Reference	Design	Duration	Control	Intervention	Results
Zhang et al., 2016[16]	*Randomized Controlled Trial*	16 weeks	15 randomized male rats were given a high-fat diet containing 2% LCT	15 randomized male rats were given a high-fat diet with 2% MCT content	1. The MCT group had significantly higher HDL levels than those that received LCT ($P < 0.05$). 2. The group that received MCT had a significantly higher HDL/non-HDL ratio than the group that received LCT ($P<0.001$).
Putri et al., 2019[17]	*Randomized Controlled Trial*	4 weeks	Positive control group: 6 male rats received a high-fat diet (14 days) and standard feed (14 days).	Group P1: 6 male rats received a high-fat diet (14 days), standard feed, and Ettawa goat milk (2.70 ml/200 g BW) (14 days). Group P2: 6 male rats received a high-fat diet (14 days), standard feed, and Ottawa goat milk (3.51 ml/200 g BW) (14 days). Group P3: 6 male rats received a high-fat diet (14 days), standard feed, and Ettawa goat milk (4.32 ml/200 g BW) (14 days).	1. There were significant differences in cholesterol levels ($P <0.05$) before and after the administration of Etawa goat milk in treatment groups 1, 2, and 3. 2. There was a decrease in TC in the four groups, namely 1.1% in the positive control group; 8.3% in the P1 group; 12.8% in the P2 group; and 19.2% in the P3 group. 3. Administration of high doses of Ettawa goat milk (4.32 ml/200 g BW) significantly reduced the TC levels of the P3 group ($P<0.05$) compared to the P1 and P2 groups which received lower doses.
Venty et al., 2016[12]	*Randomized Controlled Trial*	4 weeks	18 randomized male rats were given a high cholesterol diet (5% egg yolk, 10% lard, 1% cooking oil, 84% standard food) and 0.8 ml of distilled water/day	18 randomized male rats were given a high-cholesterol diet (5% egg yolk, 10% lard, 1% cooking oil, 84% standard food) and 0.8 ml of VCO/200 g BW/day	1. The average TC of the VCO group was lower than the control group ($p <0.05$). 2. The average TG of the VCO group was lower than the control group ($p <0.05$). 3. The average LDL of the VCO group was lower than the control group ($p <0.05$). 4. The average HDL of the VCO group was higher than the control group ($p <0.05$).
Liu et al., 2017[18]	*Randomized Controlled Trial*	16 weeks	12 randomized male rats fed a 92% high-fat diet 12 randomized male rats were given a high-fat diet of 90% + 2% oleic acid	12 randomized male rats were given a high-fat diet of 90% + 2% caprylic acid 12 randomized male rats were given a high-fat diet of 90% + 2% capric acid	1. TC and LDL levels in the caprylic acid group, TC in the oleic acid group, and TG in the capric group were significantly lower than in the high-fat group. 2. Blood HDL/LDL levels in the caprylic, capric, and oleic acid groups were significantly higher than in the high-fat groups.
Xu et al., 2013[19]		12 weeks	10 randomized male rats were given a high-cholesterol diet (1%)		

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Reference	Design	Duration	Control	Intervention	Results
	Randomized Controlled Trial		10 randomized male rats were given a diet high in cholesterol (1%) + palmitic acid (2%)	10 randomized male rats were given a diet high in cholesterol (1%) + caprylic acid (2%)	1. TC and LDL levels in the caprylic acid and capric acid diet group were significantly reduced compared to the diet with palmitic acid or stearic acid 2. Caprylic acid causes fecal excretion of neutral steroids, especially cholesterol.
			10 randomized male rats were given a diet high in cholesterol (1%) + stearic acid (2%)	10 randomized male rats were given a diet high in cholesterol (1%) + capric acid (2%)	
			10 randomized male rats were given a diet high in cholesterol (1%) + oleic acid (2%)		
			10 randomized male rats were given a diet high in cholesterol (1%) + α-linolenic acid (2%)		
Famurewa et al., 2017[20]	*Randomized Controlled Trial*	35 days	6 randomized male rats were given a normal diet and water	6 randomized male rats fed a diet supplemented with 10% VCO	1. VCO supplementation causes weight loss in rats that receive 10% VCO. 2. TC, TG, LDL-C, and VLDL levels were significantly reduced ($p < 0.01$) in VCO-supplemented mice (10% and 15%) compared to control mice. 3. HDL levels increased ($p<0.01$) in rats supplemented with VCO when compared to controls.
				6 randomized male rats fed a diet supplemented with 15% VCO	
Resende et al., 2016[21]	*Randomized Controlled Trial*	28 days	6 randomized female rats were not given physical activity and were supplemented with coconut oil	6 randomized female rats were given physical activity and supplemented with coconut oil	1. There was a decrease in pure muscle mass (lean body mass) in group G3 compared to group G2 2. In the G3 group, there was a decrease in TC 3. LDL decreased in the G2 group compared to the G1 group 4. Physical activity reduces LDL/HDL ratio, TG, and VLDL and does not affect HDL
			6 randomized female rats were given physical activity and did not receive coconut oil supplementation	6 randomized female rats were not given physical activity and received coconut oil supplementation	

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Table 3. Human study literature summary

Reference	Design	Duration	Control	Intervention	Results
Khaw et al., 2017[22]	*Randomized Clinical Trials*	4 weeks	-	94 participants were randomized to receive a diet of extra virgin olive oil, butter, and coconut oil	1. *Coconut oil* did not increase LDL significantly compared to olive oil. 2. *Coconut oil* significantly increased HDL compared to butter and olive oil. 3. There was no significant difference between coconut oil and olive oil in changes in HDL and non-HDL cholesterol
Otto et al., 2019[23]	*Randomized Controlled Trial*	12 weeks	10 women with normal lipid profiles who were not given coconut oil supplementation (COS) with physical activity	10 women with normal lipid profiles who were given coconut oil supplementation (COS) with physical activity	1. In the COS group, there was a 3% decrease in LDL
Nikooei et al., 2020	*Randomized Controlled Trial*	4 weeks	22 participants (11 men, 11 women) consumed daily food using routinely used oil.	22 participants (11 men, 11 women) were given 30 ml of virgin coconut oil (VCO) daily as an alternative to the routinely used oil type.	1. TG and VLDL levels in the VCO group decreased significantly (P = 0.001) compared to the control group. 2. HDL, LDL, and TC levels increased significantly in the VCO group (P = 0.001) compared to the control group.
Folwaczny et al, 2021	*Randomized Controlled Trial*		5 participants as controls (normolipidemic) received 3 diets containing different types of fat, namely saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and medium chain fatty acids (MCFA), which were given randomly.	8 participants with mild hypertriglyceridemia received 3 diets containing different types of fat, namely saturated fatty acids (SFA), monounsaturated fatty acids (MUFA), and medium chain fatty acids (MCFA), which were given randomly.	1. Total rates decreased significantly in both control and hypertriglyceridemia groups who received the MCFA diet (P = 0.252)

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When it enters the body, MCT is converted into two components: MCFA and Long Chain Fatty Acid (LCFA). LCFA comprises palmitic and stearic acids, while MCFA comprises capric and caprylic acids. MCFA reduces TC levels because it is a simple form of MCT that is easily absorbed in the body. Liu et al.[18] proved the results of their research, namely, the TC levels of rats fed a 90% high-fat diet with the addition of 2% caprylic acid were significantly lower than the group fed a 92% high-fat diet. This finding is supported by Xu et al.[19], where the group of rats that received a diet of caprylic acid and capric acid experienced a significant reduction in TC levels compared to the group of mice that received a diet of palmitic acid and stearic acid. MCFA reduces serum cholesterol by increasing the synthesis and excretion of bile acids in the liver, inhibiting the absorption of bile acids in the small intestine, and increasing the concentration of cholesterol and bile acids in bile and feces[18]. In addition, MCFA, especially caprylic acid, increased cholesterol metabolism in rats fed a cholesterol-rich diet. This effect is mediated by increased excretion of fecal cholesterol and cholic acid by CYP7A1, which is regulated in the liver[19]. However, based on research by Resende et al.[21] had contradictory results, which stated that the administration of Coconut Oil Supplementation (COS) did not make a significant difference in reducing TC because physical activity interventions could cause decreased TC, and unlike other saturated fats, the coconut oil did not increase plasma TC and LDL- C, although it is rich in medium chain long saturated fatty acids (12:0; lauric acid and 14:0; myristic acid). This is because COS contains MCT, which is easily absorbed by the body, thereby increasing TG and VLDL. However, COS also has the effect of increasing HDL and lowering LDL[21]. MCT lowers plasma serum cholesterol levels by inhibiting the expression of the I-BABP gene, thereby reducing the absorption of bile acids in the small intestine[8,21].

Several food sources containing MCT have a role in TG levels, namely VCO and soybean oil. This is supported based on research by Venty et al.[12], the mice that received a high-cholesterol diet with the addition of VCO had a lower TG average than the control group. Research by Zhang et al.[16] suggested that blood TG levels in rats that were given MCT experienced a significant decrease compared to mice that received LCT. In addition, the group of mice that received a low-fat diet with either soybean oil or MCT had lower liver TG levels than the group that received a diet with soybean oil or MCT.[11]. This is because MCT reduces hepatic TG synthesis by decreasing hepatic lipogenic enzyme (ACC) activity, increasing hepatic lipolytic enzyme (ACO) activity, and decreasing TG serum levels. The TG levels in the rat group that received a high-fat diet with the addition of capric acid were significantly lower than the high-fat group because MCFA contains caprylic acid and capric acid, which can reduce TG levels[18]. About 60% MCFA in VCO, consisting of 52% lauric acid and 12% myristic acid, can benefit lipid metabolism. MCFA are known to increase TG transport and catabolism, which are then directly absorbed in the intestine to the liver, excreted into the bile, and are not involved in cholesterol biosynthesis and transport. This mechanism can increase energy expenditure, reduce fat deposition in adipose tissue, increase satiety more quickly, and improve the lipid profile of the individual[20].

Not only plays a role in reducing TC and TG levels, but MCT also plays a role in LDL levels. This is supported by research by Li et al.[8], that rats that were given a high-cholesterol diet with the addition of MCT had lower total LDL than the group of mice that were given a high-cholesterol diet with the addition of LCT. Similar results were also obtained in the study by Sung et al. and Yong et al.[11,16;] rats fed a high-fat diet with MCT had lower serum LDL levels. MCT can restore serum LDL levels accompanied by decreased serum NEFA (Non-Esterified Fatty Acid) concentrations by increasing liver LDL receptors, not liver HMG-CoA reductase activity[11]. Besides being able to lower cholesterol and TG levels, MCT in VCO can play a role in improving LDL levels. Venty et al.[12] stated that rats with a high-cholesterol diet and adding VCO had lower LDL compared to the group that only received a high-cholesterol diet. The components of caprylic acid and capric acid in MCFA also have a role in lowering LDL levels. Research by Liu et al.[18] found that mice fed a high-fat diet accompanied by adding caprylic acid had significantly lower LDL levels than rats fed a high-fat diet. The same result was also obtained by Xu et al.[19], namely, the LDL levels of rats that received a high-cholesterol diet with caprylic acid and capric acid were significantly reduced compared to the group of mice that received a diet with the addition of palmitic acid and stearic acid.

MCT increases HDL concentrations in mice[11,15,19,12]. In addition, according to Liu et al.[18], MCFA and oleic acid led to significantly higher HDL levels and HDL-C/LDL-C ratios. The effect of MCT on HDL metabolism is to increase HDL synthesis in the liver through increasing the concentration of mRNA ATP Binding Cassette sub-family A member 1 (ABCA1) and protein expression in liver tissue[16]. ABCA1 is a lipid efflux carrier that regulates intracellular lipid levels by facilitating their transport to extracellular acceptors, one of which is HDL.

Results of human study research byWowet al.[22] indicate that coconut oil as a source of MCT does not significantly increase LDL levels in healthy men and women compared to olive oil. In addition, coconut oil significantly increases HDL levels compared to butter and olive oil. Based on Otto et al.[23]*,* women who received COS supplementation decreased LDL levels by 3%. Research conducted by Folwaczny et al.[24] that is in the group of participants with mild to moderate hypertriglyceridemia experienced a significant increase in plasma TG compared to the normolipidemic control group, where the increase occurred after being given the LCT diet intervention (SFA and MUFA), where this did not occur in the group with the MCT diet. Patients with mild to moderate hypertriglyceridemia may benefit from substituting LCT for MCT fats in their diets[24]*.* Research results byNikooei et al.[25] showed that the VCO intervention group experienced a significant decrease in TG and VLDL levels compared to the control group.

Meanwhile, HDL, LDL, and TC levels increased significantly in the VCO group compared to the control group. The decrease in TG and VLDL levels was due to MCFA entering the mitochondria without binding to

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carnitine, so it underwent faster oxidation. In addition, the increased HDL levels are caused by the chain length of saturated fatty acids, which tend to increase if you eat foods high in lauric and myristic acids and will increase with increasing chain length[25].

Based on the previous explanation, this research can be used as a theoretical basis for conducting experimental research on topics related to dyslipidemia. This research still has several weaknesses, namely the lack of recent reviews related to human studies that can provide significant results. In addition, this research focuses on studies related to lipid profiles without considering external factors such as body composition, body weight, and physical activity.

CONCLUSIONS

Studies in experimental animals and humans show that MCT has a role in improving lipid profiles in dyslipidemic conditions, namely by (1) increasing HDL levels by increasing ABCA1 mRNA concentration and protein expression in the liver; (2) lowering TG levels by decreasing ACC activity and increasing ACO activity; (3) lowering TC levels by increasing bile acid excretion and reducing bile acid re-absorption in the small intestine; (4) lowering LDL levels by increasing LDL receptors in the liver accompanied by a decrease in NEFA concentrations. In addition, the content of caproic, caprylic, capric, and lauric acids in MCTs positively affects lipid profiles. Further research is needed regarding the effect of MCT consumption on human lipid profiles with/without confounding factors such as physical activity.

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