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Review Article

Review: Virgin Coconut Oil and The Pharmacology Effect

Andi Maulana Kamri

Program Studi Farmasi, Fakultas Farmasi, Universitas Muslim Indonesia, Makassar, Sulawesi Selatan, Indonesia
Email: maulana.lolo@umi.ac.id

ABSTRAK

Diproduksi dari tanaman Cocos nucifera, minyak kelapa murni merupakan produk yang banyak digunakan di Indonesia, khususnya di Sulawesi Selatan di Indonesia tempat tanaman ini tumbuh. Namun, hanya sedikit orang yang menyadari dampak kesehatan sistemik virgin coconut oil (VCO). Fokus tinjauan ini ditentukan untuk menjelaskan efek farmakologi dari VCO. Artikel yang di identifikasi menggunakan metode eksperimental serta mempertimbangkan kriteria inklusi dan eksklusi dalam pemilihannya dengan menggunakan kata kunci yang digunakan. Efek nefroprotektif VCO juga dianggap sebagai efek antioksidan karena peran VCO dalam mencegah berkembangnya stres oksidatif diduga dapat menurunkan kemungkinan peningkatan ureum dan kreatinin. VCO yang mengandung medium-chain fatty acids (MCFA) dan memiliki sifat antioksidan diduga mampu menurunkan glukosa darah dengan cara meningkatkan laju metabolisme sehingga glukosa darah dapat diubah menjadi energi. Hasil yang diperoleh menunjukkan bahwa VCO mempengaruhi metabolisme glukosa dan lipid pada penderita diabetes dengan menurunkan kadar glukosa darah. VCO memiliki Asam laurat dan free fatty acids yang berfungsi untuk mereduksi stres oksidatif.

Kata Kunci: Minyak kelapa murni, Farmakologi, Imunologi, Metabolisme, Dampak Terapi

ABSTRACT

Produced from the Cocos nucifera plant, pure coconut oil is a product that is widely used in Indonesia, especially in South Celebes, where this plant grows. However, few people are aware of the systemic health effects of virgin coconut oil. (VCO). The focus of this review is to explain the pharmacological effects of VCO, as there has been no previous special review. The identified articles use experimental methods and consider inclusion and exclusion criteria in their selection using the keywords used. The nephroprotective effects of VCOs are also considered to be antioxidant effects because the role of the VCO in preventing the development of oxidative stress is suspected to reduce the likelihood of increased urea and creatinine. VCOs that contain medium-chain fatty acids (MCFAs) and have antioxidant properties are thought to be able to lower

blood glucose by increasing the rate of metabolism so that blood sugar can be converted into energy. The results showed that VCO affects glucose and lipid metabolism in diabetics by lowering blood glucose levels. VCO has lauric acid and free fatty acids that serve to reduce oxidative stress.

Keywords: Virgin Coconut Oil, Pharmacology, Immunology, Metabolism, Therapy Damage

I. INTRODUCTION

The community's choice to use natural substances to support health is very promising. It is not inferior to chemical compounds in any way, not only in terms of cost and effectiveness but also in terms of its accessibility. Virgin coconut oil (VCO) is one that is frequently utilized. One of the plants with high economic value for the people of Indonesia is the coconut (*Cocos Nucifera* L), whose product is one of the community's nine staples. Virgin coconut oil (VCO) is one of the coconut products that is currently developing and in demand (Lim *et al.*, 2014). VCO virgin coconut oil is made from fresh coconuts and is processed without high heat to preserve the oil's important content. Tocotrienols, capric, caproic, and lauric acids—natural antioxidants—can be found in coconut oil. These substances get rid of oxygen-free radicals that are bad. That has been suggested to play a significant role in diabetes mellitus, atherosclerosis, cancer, and ageing (Tan *et al.*, 2018).

Coconut oil has long been valued for its nutritional and medicinal properties. According to research on the biological effects that coconut oil has, it reduces lipid peroxidation, boosts the antioxidant defence system, and reduces oxidative stress. VCO can be digested by the body because it contains nearly 90% unsaturated and saturated fatty acids. Lauric acid has a 43-45 per cent chain unsaturated fatty acid content. Ferulic acid and p-coumaric acid are the main substances found (Xuan *et al*., 2018). The number of polyphenols that contribute to VCO's pharmacological effects. As an antioxidant reserve in the body, VCO reduces the risk of heart disease and cancer, combats free radicals, lowers cholesterol, and reduces blood fat in the body (Ademola Clement Famurewa & Ejezie, 2018).

VCO likewise has a few cell reinforcement impacts that have anti-thrombogenic, antiarthritis, antihyperlipidemic, cardioprotective, antiosteoporosis, mitigating, antimicrobial, hepatoprotective, and neuroprotective impacts (Sinaga *et al.*, 2019). In addition, by increasing CD4 and CD8, virgin coconut oil can have an effect on skin disorders,

reduce the risk of virus infection, and make the body more resistant to oxidative stress (Haron *et al.,* 2019). Virgin coconut oil mostly consists of saturated fatty acids. The majority of the fatty acids are composed of lauric, myristic, and palmitic acids. Most of the lipids in virgin coconut oil are medium chain fatty acids. As a result, they are immediately absorbed by the intestines and sent to the liver to be used as an energy source (Elshemy, 2018). During the postmenopausal period, hormonal disorders can cause oxidative stress, which can lower bone density and damage enzymes that help regulate blood lipids (Zheng *et al.,* 2016).

Due to its capacity to provide some biological activities that are beneficial to human health, virgin coconut oil (VCO) has emerged as a functional food oil. This is because some minor components, like phenolic compounds and tocopherols, are kept. VCO is made from fresh, mature coconut kernels by mechanical or natural methods, with or without the use of heat, and specifically without the use of any chemical refining, bleaching, or deodorizing agents (RBD) (Rohman *et al.*, 2021). Consequently, some physicochemical properties of VCO and RBD coconut oil differ slightly. VCO exhibited a number of pharmacological activities due to the presence of phenolic compounds, including antioxidant, anti-inflammatory, immunomodulatory, anti-hyperlipidemia, anti-cancer, anti-bacterial, anti-diabetic, and neuroprotective properties (Rohman *et al.,* 2021).

There are, of course, a lot of different pharmacological effects based on the various effects that VCO has and a number of studies. Researchers looked into the antioxidants in Virgin Coconut Oil because of this. VCO, on the other hand, is not well-known among millennials, but it can be a good option for health maintenance. This review showed VCO have more effect esspesialy for metabolism and no review about this before.

I. METHOD

We used method review assessment with identified 421 articles in PubMed database and assessment 8 article include inclusion criteria. Include criteria are paper use experimental method, attend the result test, and they did repeated for animals test. Article doesn’t have have analysis not add in assessment. We analysis effect pharmacology and mechanism from virgin coconut oil in experimental research used mice. Searching process with Patient/Problem, Intervention, Compare, and Outcome (PICO) “Virgin coconut oil” and/or “Effectiveness VCO” and/or “VCO antioxidant”.

II. RESULT AND DISCUSSION

A. Metabolism of VCO

Despite having identical fatty acid profiles, VCO has higher concentrations of polyphenolic antioxidants like caffeic acid, ferulic acid, syringic acid, catechin, and epigallocatechin. It is generally known that these polyphenolics have anti-diabetic and insulin-sensitizing properties. By lowering lipogenesis and increasing the rate of fatty acid metabolism, supplementing with VCO has been shown to have positive effects on lipid parameters. Additionally, chemopreventive, anti-inflammatory, analgesic, and antipyretic properties are documented for VCO. Diets high in saturated fat and high fructose or sucrose are known to cause insulin resistance. In the past, several of research used high fructose diets and VCO as a source of fatty acids to create insulin resistance and glycemic conditions. In this study, the impact of changing a high-fructose diet to include VCO instead of CO is assessed (Narayanankutty *et al.*, 2016).

The synthesis and metabolism of human cholesterol are tightly controlled by intricate systems. The target of statin therapy, 3-hydroxy-3-methylglutaryl-CoA (HMGCoA) reductase (HMGCR), is one of the numerous processes in cholesterol production from 2-4 carbon units and is largely acknowledged as the rate-limiting step. The P450 gene CYP7A1 that codes for cholesterol 7-hydroxylase mediates the first committed step in cholesterol breakdown, leading to the traditional bile salt production pathway (Liu *et al.,* 2019).

The transcription of five genes with links to cholesterol metabolism were examined. Two of them responded well to oil treatment. CYP7A1 and HMGCR. With deacidification and then further with bleaching, the mean HMGCR dramatically rose. Compared to VCO and increased marginally considerably after deodorization. The opposite was true for CYP7A1, which decreased after de-acidification and bleaching and then levelled off after deodorization (Liu *et al.*, 2019).

When rats engage in their highest level of physical activity, VCO treatment can lower levels of urea and creatine. Antioxidants such tocopherol, tocotrienol, flavonoids, and certain polyphenol chemicals are known to be present in VCO. Given that these antioxidants are present, taking VCO for 28 days will boost glutathione peroxidase levels and lessen the occurrence of lipid peroxidation, which is indicated by a drop in MDA levels (Famurewa *et al.*, 2017). Several scholars who reported the impact of VCO on oxidative stress backed up the findings of this study. In the serum of mice undergoing the forced swim test and the brains of mice under continuous cold constraint, VCO was able to decrease lipid peroxidation and boost superoxide dismutase (SOD) activity (Rahim *et al.*, 2017; Sinaga *et al*., 2019).

The findings of this study are related to the presence of medium-chain fatty acids and polyphenol chemicals. When combined with conjugated dienes (CD), the administration of VCO polyphenol can raise superoxide

dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), and glutathione (GSH) levels while lowering MDA levels (Sinaga *et al.*, 2019).

B. Pharmacology VCO

The liver and kidneys' metabolism can be slowed down and blood flow altered by physical activity. Kidney function is influenced in part by the rate of glomerular filtration. Leukocyte activation or free radicals can cause kidney problems in some situations. Leukocyte actuation is likewise one of the reasons for oxidative pressure which influences the expansion in urea, creatinine, GFR, and protein catabolism. Urea and creatinine can be reduced by VCO, which has antioxidant and anti-inflammatory properties (Famurewa *et al.*, 2020). Tocopherols, tocotrienols, flavonoids, and polyphenols are among the VCO's antioxidant components (Rahim *et al.*, 2017). VCO is considered to increment glutathione peroxidase levels and decrease the gamble of lipid peroxidation which will set off the development of malondialdehyde (MDA) which assumes a part in the arrangement of free revolutionaries (Alabi & Akomolafe, 2020). The nephroprotective effect of VCO is also considered an antioxidant effect because the role that VCO plays in preventing the development of oxidative stress is thought to lower the likelihood of an increase in urea and creatinine (Famurewa *et al*., 2020). From checking TNF-α, histopathologic, creatinine, and urea. These results showed that VCO might help prevent nephrotoxic damage caused by diclofenac (Famurewa *et al*., 2020). After intense physical activity, virgin coconut oil is effective in preventing oxidative stress. In diabetic patients, total VCO based on checked BUN, urea, creatinine, and protein is effective in preventing renal damage (Akinnuga *et al.*, 2014). Diabetes mellitus is a metabolic syndrome disorder that can raise blood glucose. This is because the body lacks insulin, making it unable to handle the rise in blood glucose brought on by the consumption of carbohydrates and gluconeogenesis in the liver (Liu *et al.*, 2019). VCO, which contains medium-chain fatty acids (MCFA) and has antioxidant properties, is thought to be able to lower blood glucose by increasing the metabolic rate so that blood glucose can be converted into energy (Mirzaei, *et al*. 2019).

The plasma all-out cholesterol (TC), fatty substance (TG), and high-thickness lipoprotein (HDL). In HCD/HLD group rats, VCO showed a significant (p 0.05) increase in HDL and a significant (p 0.05) decrease in TC, TG, Low-density lipoprotein (LDL), and Very low-density lipoprotein (VLDL) levels. The experimental rats' lipid profiles showed that VCO has anti-atherosclerotic activity

(Shariq *et al.*, 2015). Medium-chain fatty acids (MCFA), which are easily absorbed by the body and play an important role in enzymatic and metabolic processes, are found in VCO. In some respects, MCFA is regarded as an antimicrobial that boosts the body's immune system. Additionally, the body may benefit from the increased absorption of magnesium, calcium, and amino acids by MCFA. The body will also convert the lauric acid in VCO into monolaurin, also known as a monoglyceride, which is a component of powerful compounds that fight bacteria, viruses, and protozoa. This indicates that VCO can be an effective anti-infection probiotic. VCO has been shown to inhibit Bacillus subtilis, Escherichia coli, Salmonella enteritidis, and Staphylococcus aureus. It also contains free fatty acids. Therefore, VCO's lauric acid only has antibacterial properties. As a hepatoprotective agent, giving VCO also affects the health of the liver. Histological findings that VCO had a hepatoprotective effect that required further investigation were further supported by the results of AST, ALP, and histopathology that showed reduced liver damage caused by the administration of paracetamol (Supriatna *et al.*, 2018).

Bone lipid peroxidation, glutathione peroxidase, and superoxide dismutase all increased when VCO was used in the elderly. Antioxidants are considered a novel therapeutic agent in the prevention and treatment of postmenopausal osteoporosis, as the outcome demonstrated that VCO can prevent lipid peroxidation and increase antioxidant enzymes in the osteoporotic rat. In addition, it demonstrates, particularly for women, that VCO can alter the hormone estrogen, which has an effect on the bones, where levels have begun to decline as people get older. VCO was successful in preventing estrogen-induced bone loss and maintaining bone structure (Albornoz *et al.*, 2023). VCO guards against MTX-induced liver damage by lowering oxidative stress, lipid peroxidation, and boosting antioxidant enzyme activity (Famurewa *et al*., 2017; Kamri *et al*., 2023). Pharmacology effect of VCO can be seen at Table I.

VCO has the potential to be used as a memory enhancer, with its effect mediated, at least in part, by increased cholinergic activity, increased levels of antioxidants, and decreased oxidative stress. Based on the WBC, MCV, MCHC, Lymfosite, and MCH blood profiles, as well as the serum calcium, phosphate, and ferric levels and total antioxidant capacity. According to VCO probably improved the antioxidant status of Alzheimer's disease in rats and improved the status of blood cells and blood factors (Mirzaei *et al.*, 2019). Compared to older patients, adults typically

have a better metabolism and endurance. Notwithstanding, a lessening in digestion and well-being can happen all the more rapidly because old enough. Due to a lifestyle that lowers the body's resistance, the use of VCO will play a greater role in maintaining body health and preventing dangerous comorbidities. Therefore, the protective effect demonstrated by VCO may offer a means of maintaining the human body over time (Sinaga *et al.*, 2019). Virgin coconut oil keeps up with general well-being for both grown-up and older patients regardless of comorbidities. It is regarded as a probiotic with renal, hepatic, and neuroprotective effects, allowing it to maintain hormone health by preserving bone density and syndrome metabolites. (Famurewa *et al.*, 2020; Narayanankutty *et al.*, 2016; Rohman *et al.*, 2021).

Table I. Pharmacology effect virgin coconut oil

Study	Research Design	Induced	VCO Dose	Effect for organ
Akinnuga *et al*., 2014	Experimental	Alloxan 150 mg/kg body weight	10% VCO	Renal
Sinaga *et al*., 2019	Experimental	Free radicals	1-4 ml/ 200 g body weight	Renal
Famurewa *et al*., 2020	Experimental	Diclofenac oxidative	5-10 ml/kg body weight	Renal
Famurewa *et al*., 2017	Experimental	Methotrexate 20 mg/kg body weight	5% and 15% for supplement	Metabolic syndrome and Hepatic
Elshemy, 2018	Experimental	Alloxan 150 mg/kg body weight	VCO 10 ml/kg body weight	Metabolic syndrome and Hepatic
Shariq *et al*., 2015	Experimental	Atherogenic	1 ml/day/ 270 g body weight	Metabolic syndrome and Hepatic
Mirzaei *et al*., 2019	Experimental	Surgery condition	8% VCO and 10% VCO	Neuron
Rahim *et al*., 2017	Experimental	Changed normal nightlife condition	VCO of 1, 5 and 10 g/kg	Neuron

IV. CONCLUSION

The nephroprotective effect of VCO is also considered an antioxidant effect because the role that VCO plays in preventing the development of oxidative stress is thought to lower the likelihood of an increase in urea and creatinine. VCO, which contains medium-chain fatty acids

(MCFA) and has antioxidant properties, is thought to be able to lower blood glucose by increasing the metabolic rate so that blood glucose can be converted into energy.

CONFLICT OF INTEREST

The author declares no conflict of interest in this research.

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