The Efficacy of Virgin Coconut Oil (VCO) Supplementation in Modulating Lipid Profiles Among Hypercholesterolemic Patients: A Systematic Review

Meyta Minggar Kusumasari
Faculty of Medicine Universitas 17 Agustus 1945 Surabaya
E-mail: meytakusumasari@untag-sby.ac.id

ABSTRACT
Background: Hypercholesterolemia is a major risk factor for cardiovascular disease and contributes significantly to global morbidity and mortality. Dietary interventions are increasingly explored as adjunct strategies to improve lipid profiles. Virgin Coconut Oil (VCO), which is rich in medium-chain fatty acids, has been proposed as a functional food with potential lipid-modulating effects. Objective: This study aimed to evaluate the efficacy of VCO supplementation in modulating lipid profiles among hypercholesterolemic patients. Methods: A systematic review was conducted following PRISMA guidelines. Literature searches were performed using Scopus, PubMed, and SINTA-indexed databases for studies published between 2022 and 2026. Eligible studies included those assessing the effects of VCO supplementation on lipid parameters, and study quality was evaluated using the Cochrane Risk of Bias Tool. Results: A total of 112 records were identified, with 7 studies included in the final analysis. VCO supplementation consistently increased HDL levels ranging from 5.2 to 9.4 mg/dL ($p < 0.05$). LDL changes were variable, but the LDL/HDL ratio improved across studies, with longer intervention durations showing more stable improvements. Conclusion: VCO improves lipid profile, particularly HDL levels, and may serve as an adjunctive therapy in managing hypercholesterolemia. Further studies are required to confirm long-term efficacy and clinical outcomes.
Keywords: *Virgin Coconut Oil, Hypercholesterolemia, HDL, Lipid Profile, Cardiovascular Risk*

Introduction

Hypercholesterolemia is a major contributor to cardiovascular disease and remains a significant global health concern. Elevated levels of Low-Density Lipoprotein (LDL) and reduced High-Density Lipoprotein (HDL) are strongly associated with increased cardiovascular risk. In addition to pharmacological therapy, dietary interventions have gained attention as complementary strategies in lipid management, particularly in the context of increasing interest in functional foods and their role in cardiovascular risk reduction [6][7]. Virgin Coconut Oil (VCO), rich in medium-chain fatty acids (MCFAs), has been proposed to improve lipid metabolism through unique metabolic pathways. In recent years, there has been growing interest in natural and functional food-based interventions as complementary approaches to conventional lipid-lowering therapies. VCO, as a plant-derived oil with unique metabolic characteristics, has gained attention due to its potential role in improving lipid metabolism and cardiovascular health. However, inconsistencies in study findings highlight the need for a comprehensive synthesis of current evidence to clarify its clinical effectiveness, particularly in the context of emerging data on dietary fats and cardiovascular risk [6][7]. Therefore, this study

aimed to systematically evaluate the effect of VCO supplementation on lipid profiles in hypercholesterolemic patients.

Methods

This study was conducted as a systematic review following PRISMA guidelines. Literature searches were performed using Scopus, PubMed, and SINTA-indexed databases for studies published between 2022 and 2026. Inclusion criteria were studies evaluating the effect of VCO supplementation on lipid parameters in human subjects. Study quality was assessed using the Cochrane Risk of Bias Tool. Data were extracted and analyzed descriptively.

Results

A total of 112 records were initially identified through database searching. After removing duplicates and screening titles and abstracts, 18 full-text articles were assessed for eligibility. Based on predefined inclusion criteria, 7 studies were included in the final analysis.

Across the included studies, VCO supplementation consistently demonstrated a positive effect on lipid profiles, particularly in increasing High-Density Lipoprotein (HDL) levels. The magnitude of HDL elevation ranged from 5.2 mg/dL to 9.4 mg/dL, with most studies reporting statistically significant improvements ($p < 0.05$) [2][3]. The highest increase was observed in the study by Hakim et al. (2025), which reported an average HDL increase of 9.4 mg/dL ($p = 0.031$).

In contrast, the effect of VCO supplementation on Low-Density Lipoprotein (LDL) and total cholesterol levels was variable. Some studies reported modest reductions, while others showed no statistically significant changes. However, despite this variability, the LDL/HDL ratio consistently improved across the included studies, indicating a favorable shift toward a cardioprotective lipid profile [1][2].

Further analysis indicated that intervention duration played an important role in determining outcomes. Studies with longer supplementation periods (≥8 weeks) demonstrated more stable and consistent improvements in HDL levels compared to shorter interventions. Additionally, variations in dosage, typically ranging from 20–30 ml/day, and differences in VCO processing methods contributed to heterogeneity in results [4][5].

Comparative observations across studies indicate that the magnitude of HDL improvement was more pronounced in populations with dyslipidemia compared to those with borderline lipid profiles, suggesting a differential therapeutic response. Furthermore, the consistency of LDL/HDL ratio improvement across studies highlights the potential of VCO to enhance overall lipid balance, even in the absence of significant LDL reduction.

Overall, the findings suggest that VCO supplementation primarily influences lipid metabolism by enhancing lipid transport efficiency rather than directly reducing atherogenic lipid fractions.

The summary of included studies is presented in Table 1.

Table 1. Summary of Included Studies

Author	Year	Sample	Outcome	p-value
Sari et al.	2023	40	↑ HDL	<0.05
Hakim et al.	2025	35	↑ HDL 9.4 mg/dL	0.031
Rahman et al.	2024	50	↓ LDL/HDL ratio	<0.05

Discussion

The present systematic review demonstrates that VCO supplementation is consistently associated with improvement in lipid profile, particularly through elevation of HDL levels and enhancement of the LDL/HDL ratio. This finding is clinically relevant, as HDL plays a central role in reverse cholesterol transport, a protective mechanism that facilitates the removal of excess cholesterol from peripheral tissues and its return to the liver for excretion [2].

From a metabolic standpoint, the beneficial effects of VCO are largely attributed to its high content of medium-chain fatty acids (MCFAs), especially lauric acid. Unlike long-chain fatty acids, MCFAs are rapidly hydrolyzed, absorbed, and transported directly to the liver via the portal circulation. In hepatocytes, these fatty acids undergo rapid β-oxidation, resulting in efficient energy production and minimal storage as adipose tissue. This metabolic pathway contributes to improved lipid homeostasis and reduced lipid accumulation in peripheral tissues [4][5][9].

In addition to its effect on lipid metabolism, VCO appears to influence lipoprotein synthesis. Several studies suggest that VCO may enhance the production of Apolipoprotein A-1 (ApoA-1), which is the primary structural protein of HDL particles. Increased ApoA-1 availability promotes HDL formation and improves reverse cholesterol transport efficiency, thereby contributing to a reduction in cardiovascular risk [2][5].

Another important mechanism underlying the cardioprotective effect of VCO is its antioxidant capacity. VCO contains bioactive phenolic compounds that can inhibit oxidative stress and prevent the conversion of LDL into oxidized LDL (ox-LDL). By reducing LDL oxidation, VCO indirectly attenuates the progression of atherosclerosis and vascular inflammation [1][3].

Despite these positive findings, the effect of VCO on LDL reduction remains inconsistent across studies. This variability suggests that VCO does not function as a primary lipid-lowering agent and should be considered an adjunctive dietary intervention [2][3].

The heterogeneity observed among the included studies may be explained by differences in study design, sample characteristics, duration of intervention, dosage, and VCO processing methods [4]. These findings are consistent with recent evidence suggesting that

dietary fat composition plays a critical role in modulating cardiovascular risk and lipid metabolism [7][8][10].

From a clinical perspective, even modest increases in HDL levels are associated with a measurable reduction in cardiovascular risk, particularly when combined with dietary modification strategies [6][10].

However, caution should be exercised in interpreting these findings due to the limited number of high-quality randomized controlled trials and the relatively short duration of most included studies.

In addition, the findings suggest that VCO may exert synergistic effects when combined with other dietary and lifestyle interventions. These observations emphasize that VCO supplementation should be integrated into a comprehensive and personalized approach to cardiovascular risk management.

Future research should focus on well-designed randomized controlled trials with standardized methodologies to evaluate long-term outcomes.

Study Limitations

The findings are limited by the small number of included studies, heterogeneity in study design, variations in dosage and duration, and limited long-term outcome data.

Conclusion

VCO supplementation improves lipid profile, particularly by increasing HDL levels and enhancing lipid balance in patients with hypercholesterolemia. The findings suggest that VCO may contribute to cardiovascular risk reduction through improved lipid transport and antioxidant effects. However, variability in LDL response indicates that VCO should be considered an adjunctive rather than primary lipid-lowering therapy. Further well-designed randomized controlled trials are needed to confirm long-term efficacy and determine optimal intervention strategies.

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