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RESEARCH ARTICLES

# *Virgin Coconut Oil* dan *Extra Virgin Olive Oil* terhadap Kadar Kolesterol Total dan Trigliserida pada Tikus Putih Obesitas Hiperglikemik

## *Virgin Coconut Oil and Extra Virgin Olive Oil on Total Cholesterol and Triglyceride Levels in Hyperglycemic Obese White Rats*

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### *Abstract*

*The increasing prevalence of obesity and metabolic disorders highlights the need for effective dietary interventions to improve lipid profiles and reduce cardiovascular risk. This study compares the effects of Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) on lipid profiles, specifically total cholesterol and triglyceride levels, in hyperglycemic obese Wistar rats. Obesity and hyperglycemia are major risk factors for cardiovascular diseases and type 2 diabetes. A total of 24 male rats were divided into three groups: a negative control, a VCO group, and an EVOO group. Rats were placed on a high-fat diet for 14 days and administered 2 mL/kg body weight of either VCO or EVOO via oral gavage. Blood samples were collected at baseline, Day 7, and Day 14 for lipid profile analysis. Results revealed that both VCO and EVOO significantly reduced total cholesterol and triglyceride levels compared to the control group. Notably, EVOO resulted in a more substantial reduction in both total cholesterol (to 130,83 ± 24,807 mg/dL) and triglycerides (to 108,17 ± 17,612 mg/dL) by Day 14, surpassing the effects of VCO. These findings suggest that both oils are effective in improving lipid profiles in hyperglycemic obese rats, with EVOO demonstrating superior efficacy. This study provides valuable insights into the potential of VCO and EVOO as dietary interventions for managing obesity-related metabolic disorders, emphasizing EVOO's greater effectiveness in lipid management.*

***Keywords:*** *extra virgin olive oil, virgin coconut oil, obesity, triglycerides*

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**Abstrak**

Peningkatan obesitas dan gangguan metabolik menuntut intervensi diet yang efektif untuk memperbaiki profil lipid dan menurunkan risiko kardiovaskular. Penelitian ini membandingkan efek *Virgin Coconut Oil* (VCO) dan *Extra Virgin Olive Oil* (EVOO) terhadap profil lipid, khususnya kadar kolesterol total dan trigliserida, pada tikus Wistar obesitas dengan hiperglikemia. Obesitas dan hiperglikemia merupakan faktor risiko utama untuk penyakit kardiovaskular dan diabetes tipe 2. Sebanyak 24 tikus jantan dibagi menjadi tiga kelompok: kelompok kontrol negatif, kelompok VCO, dan kelompok EVOO. Tikus diberi diet tinggi lemak selama 14 hari dan diberi 2 mL/kg berat badan VCO atau EVOO melalui pemberian oral. Sampel darah dikumpulkan pada baseline, Hari 7 dan Hari 14 untuk analisis profil lipid. Hasil menunjukkan bahwa baik VCO maupun EVOO secara signifikan menurunkan kadar kolesterol total dan trigliserida dibandingkan dengan kelompok kontrol. Secara mencolok, EVOO menghasilkan penurunan yang lebih signifikan pada kolesterol total (menjadi 130,83 ± 24,807 mg/dL) dan trigliserida (menjadi 108,17 ± 17,612 mg/dL) pada hari ke-14, melebihi efek VCO. Temuan ini menunjukkan bahwa kedua minyak tersebut efektif dalam meningkatkan profil lipid pada tikus obesitas hiperglikemik, dengan EVOO menunjukkan efektivitas yang lebih unggul. Studi ini memberikan wawasan berharga tentang potensi VCO dan EVOO sebagai intervensi diet untuk mengelola gangguan metabolik terkait obesitas, dengan penekanan pada efektivitas EVOO yang lebih besar dalam pengelolaan lipid.

**Kata Kunci:** minyak kelapa murni, minyak zaitun ekstra virgin, obesitas, trigliserida

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**Highlight:**

- Both Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) significantly improved lipid profiles in hyperglycemic obese rats by reducing total cholesterol and triglyceride levels compared to the negative control group.
- Extra Virgin Olive Oil (EVOO demonstrated superior efficacy in lowering lipid levels, achieving the greatest reductions in total cholesterol (26,9%) and triglycerides (30,8%) by Day 14.
- The lipid-lowering effect of EVOO is likely attributed to its high content of monounsaturated fatty acids and polyphenolic antioxidants, highlighting its potential as a dietary intervention for managing obesity-related metabolic disorders and cardiovascular risk.

## INTRODUCTION

The rising prevalence of obesity and related metabolic disorders, such as type 2 diabetes, underscores the need for effective interventions to manage lipid profiles and reduce cardiovascular risks. Obesity, a leading risk factor for chronic diseases like hypertension, heart disease, and dyslipidemia, contributes to metabolic disturbances such as hyperglycemia and insulin resistance. Globally, the incidence of obesity has surged, with Indonesia seeing an increase from 10,5% in 2007 to 21,8% in 2018 (Ruze et al., 2023; Setiati, 2015; Uli et al., 2023). This condition is often accompanied by elevated cholesterol and triglyceride levels, which can exacerbate insulin resistance and increase the risk of cardiovascular diseases (Goyal et al., 2023; Masi and Oroh, 2018).

Dietary fats play a significant role in modulating lipid metabolism and mitigating obesity-related complications. Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) have garnered attention for their potential health benefits, particularly in improving lipid profiles. VCO is rich in medium-chain fatty acids (MCFAs), particularly lauric acid, which has been linked to improved cholesterol levels, anti-inflammatory effects, and enhanced fat oxidation (Hesaham et al., 2021; Schumacher et al., 2016). Moreover, VCO's antioxidant properties may help protect against oxidative stress, a common issue in obesity (Vasconcelos et al., 2020).

In contrast, EVOO is predominantly composed of monounsaturated fatty acids, such as oleic acid, and contains phenolic compounds known for their cardiovascular protective properties (Khaw et al., 2018). The Mediterranean diet, rich in EVOO, is associated with lower heart disease rates and improved lipid profiles (Rohman, 2017). EVOO's potential benefits include reducing total cholesterol, enhancing the cholesterol/HDL-C ratio, and lowering triglyceride levels through its anti-inflammatory and antioxidant effects (Khaw et al., 2018; Rohman, 2017).

While the individual benefits of VCO and EVOO on lipid metabolism are well-documented, their comparative effects, particularly in hyperglycemic obese rats, remain less explored. Obesity and hyperglycemia often coexist, with elevated triglycerides and cholesterol levels contributing to insulin resistance. In individuals with type 2 diabetes, this combination further impairs insulin function and increases the risk of cardiovascular events (Lin and Li, 2021). Research suggests that VCO may lower cholesterol and triglyceride levels more effectively than other oils, while EVOO has been shown to enhance lipid profiles and insulin sensitivity (De Santis et al., 2019; Wijaya and Surdijati, 2020).

The novelty of this research lies in directly comparing the effects of VCO and EVOO on lipid metabolism in hyperglycemic obese rats. This study aims to elucidate their differential impacts on total cholesterol, LDL, HDL, and triglycerides, providing valuable insights into their roles in managing obesity and metabolic disorders. Understanding how these oils influence lipid profiles in a hyperglycemic context could pave the way for targeted dietary interventions to combat obesity and its associated risks. By investigating the specific contributions of VCO and EVOO to metabolic health, this research addresses a critical gap in the existing literature and offers potential avenues for improving dietary strategies in obesity management.

## METHODS

This study is a true experimental design with a pre and post-test approach, using a control group. The research subjects were male Wistar strain white rats (Rattus norvegicus), aged 8-10 weeks, obtained from the Faculty of Medicine Laboratory, Muslim University of Indonesia. The study was conducted from August to September 2024. A total of 24 rats were randomly divided into three groups: a negative control group, a VCO group (administration of virgin coconut oil), and an EVOO group (administration of extra virgin olive oil). The rats in the negative control group were given standard laboratory feed and a placebo (Na-CMC solution, 1 mL/day). The VCO and EVOO groups were administered a high-fat and high-carbohydrate diet, with the specific composition consisting of 60% fat (lard), 20% carbohydrate (sucrose), and 20% protein (casein). VCO and EVOO were administered at a dose of 2 mL/kg body weight per day, administered via oral gavage.

The rats in these two experimental groups were provided with the high-fat, high-carbohydrate diet for 14 days, with daily oil administration (VCO for the VCO group and EVOO for the EVOO group). Obesity was induced by providing an obesogenic diet (high-fat, high-carbohydrate feed) and monitoring weight gain. Obesity was confirmed using the Lee index, which is calculated based on body weight and body length measurements. Hyperglycemia was induced using alloxan monohydrate, administered intraperitoneally at a dose of 24 mg/200 g of body weight. Blood glucose levels were measured before and after alloxan induction to confirm the onset of hyperglycemia. Blood samples were collected at baseline (before treatment), on day 7, and on day 14 of the intervention. Blood glucose levels were measured before and after alloxan induction using a glucometer. Total cholesterol and triglyceride levels were measured using a lipid profile meter at the specified time points.

Data obtained were analyzed using SPSS for Windows. The Shapiro-Wilk test was conducted to assess the normality of data distribution. For normally distributed data, paired T-tests and one-way ANOVA were used to compare the differences within and between groups. For non-normally distributed data, the Wilcoxon signed-rank test and Kruskal-Wallis test were applied. A significance level of $p < 0{,}05$ was considered statistically significant. This study aims to evaluate the effects of VCO and EVOO on total cholesterol and triglyceride levels in hyperglycemic obese rats. The results are expected to provide insights into the potential benefits of these oils in managing obesity and hyperglycemia, which could be valuable in the development of dietary interventions for metabolic disorders. This study had complied with research ethics standards and received ethical approval under reference number 414/A.1/KEP-UMI/VIII/2024.

## RESULTS AND DISCUSSIONS

### Comparison of total cholesterol and triglyceride levels before and after treatment

Table 1 presents a comparison of total cholesterol levels before and after treatment across three groups: Negative Control, VCO (Virgin Coconut Oil), and EVOO (Extra Virgin Olive Oil). The data shows significant variations in cholesterol levels at different time points, specifically Days 0-7, 0-14, and 7-14. During the D0-7 period, the Negative Control group had a mean cholesterol level of 193,67 ± 33,224 mg/dL, with a statistically significant p-value of 0,013, indicating a notable change. In contrast, the VCO group showed a mean cholesterol level of 174,67 ± 25,169 mg/dL but had a p-value of 0,614, suggesting no significant difference. Conversely, the EVOO group initially recorded a mean level of 179,00 ± 27,821 mg/dL, with a highly significant p-value of 0,001.

**Table 1. Comparison of total cholesterol levels before and after treatment in all groups**

| Time | Negative Control | p-value | VCO | p-value | EVOO | p-value |
|---|---|---|---|---|---|---|
| | Mean ± SD | | Mean ± SD | | Mean ± SD | |
| D0-7 | 193,67 ± 33,224<br>204,17 ± 29,082 | 0,013 | 174,67 ± 25,169<br>173,17 ± 29,451 | 0,614 | 179,00 ± 27,821<br>155,50 ± 27,275 | 0,001 |
| D0-14 | 193,67 ± 33,224<br>213,67 ± 28,780 | 0,001 | 174,67 ± 25,169<br>162,83 ± 32,015 | 0,022 | 179,00 ± 27,821<br>130,83 ± 24,807 | 0,001 |

| | | | | | | |
|---|---|---|---|---|---|---|
| D7-14 | 204,17 ± 29,082<br>213,67 ± 28,780 | 0,015 | 173,17 ± 29,451<br>162,83 ± 32,015 | 0,004 | 155,50 ± 27,275<br>130,83 ± 24,807 | 0,001 |

Note: *Paired t test, significant if p-value <0,05

Over a longer duration (D0–14) (Table 1), the Negative Control group's mean cholesterol increased to 213,67 ± 28,780 mg/dL, with a significant p-value of 0,001. The VCO group showed a decrease in mean cholesterol to 162,83 ± 32,015 mg/dL, with a p-value of 0,022, again indicating significant improvement. The EVOO group exhibited a significant decrease to 130,83 ± 24,807 mg/dL and a p-value of 0,001. In the final comparison during the D7-14 period, the Negative Control group maintained a mean level of 213,67 ± 28,780 mg/dL (p-value= 0,015*)*, while VCO and EVOO groups showed further reductions in cholesterol levels, demonstrating significant p-values of 0,004 and 0,001, respectively.

Based on Figure 1, presents the graph illustrating the changes in total cholesterol levels across all treatment groups. The study involved administering Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) to hyperglycemic obese white rats, with the aim of evaluating their effects on cholesterol levels. The results indicate that both VCO and EVOO led to a reduction in total cholesterol levels in the rats. However, the group that received EVOO demonstrated a more pronounced decrease in total cholesterol compared to the other groups.

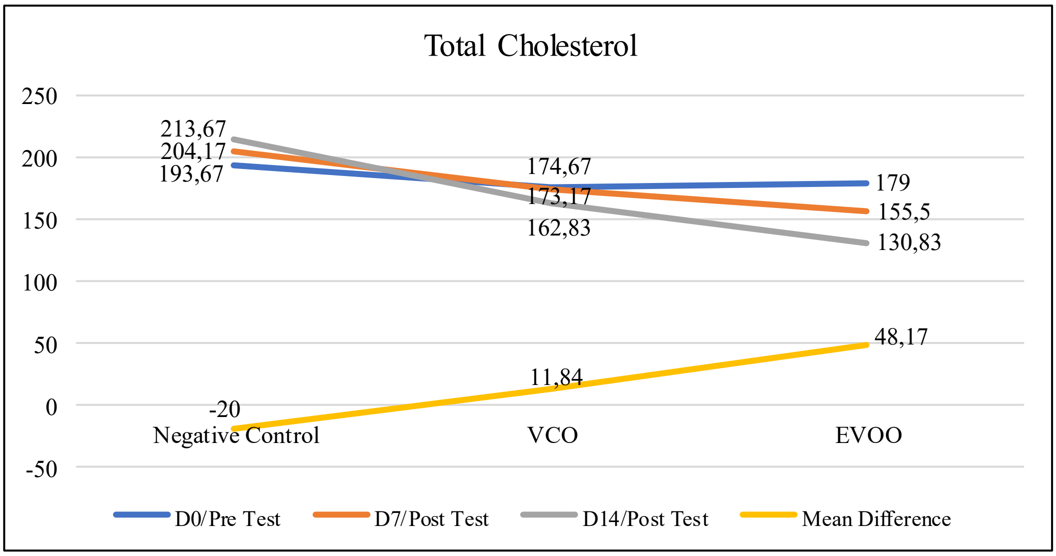


**Figure 1. Chart of total cholesterol levels in all groups**

This finding suggests that EVOO (Figure 1) may possess superior cholesterol-lowering properties, which could be attributed to its higher content of beneficial compounds, such as polyphenols and antioxidants. These compounds are known to play a significant role in improving lipid profiles and reducing oxidative stress, which is often elevated in conditions like obesity and hyperglycemia. The effectiveness of EVOO in lowering total cholesterol levels highlights its potential as a dietary intervention for managing cholesterol and promoting cardiovascular health in individuals with obesity and related metabolic disorders.

**Table 2. Comparison of triglyceride levels before and after treatment in all groups**

| Time | Negative Control | p-value | VCO | p-value | EVOO | p-value |
|---|---|---|---|---|---|---|
| | Mean ± SD | | Mean ± SD | | Mean ± SD | |
| D0-7 | 158,00 ± 21,194<br>172,83 ± 18,104 | 0,001 | 146,50 ± 18,328<br>140,17 ± 21,526 | 0,076 | 156,33 ± 20,849<br>131,17 ± 17,759 | 0,008 |
| D0-14 | 158,00 ± 21,194<br>184,33 ± 22,429 | 0,001 | 146,50 ± 14,195<br>133,67 ± 22,241 | 0,009 | 156,33 ± 20,849<br>108,17 ± 17,612 | 0,001 |
| D7-14 | 172,83 ± 18,104<br>184,33 ± 22,429 | 0,005 | 140,17 ± 21,526<br>133,67 ± 22,241 | 0,010 | 131,17 ± 17,759<br>108,17 ± 17,612 | 0,001 |

Note: *Paired t test, significant if p-value <0,05

Table 2 presents a comparison of triglyceride levels before and after treatment among the Negative Control group, Virgin Coconut Oil (VCO) group, and Extra Virgin Olive Oil (EVOO) group across three time intervals: Days 0-7, 0-14, and 7-14, analyzed using paired t-tests. At D0-7, the Negative Control group had a triglyceride level of 158,00 ± 21,194 mg/mL (p-value = 0,001), while the VCO group recorded 146,50 ± 18,328 mg/mL (p-value = 0,076), indicating no significant change, and the EVOO group had 156,33 ± 20,849 mg/mL (p-value = 0,008). By Day 7, the Negative Control group's levels increased to 172,83 ± 18,104 mg/mL, but both the VCO (140,17 ± 21,526 mg/mL) and EVOO (131,17 ± 17,759 mg/mL) groups showed significant reductions. At D0-14, the Negative Control group's levels rose to 184,33 ± 22,429 mg/mL (p-value = 0,001), whereas the VCO and EVOO groups decreased substantially to 133,67 ± 22,241 mg/mL (p-value = 0,009) and 108,17 ± 17,612 mg/mL (p-value = 0,001), respectively. By D7-14, the Negative Control group continued to show an upward trend, while VCO maintained its decreased levels (133,67 ± 22,241 mg/mL, p-value = 0,010), and EVOO showed the most significant reduction (108,17 ± 17,612 mg/mL, p-value = 0,001).

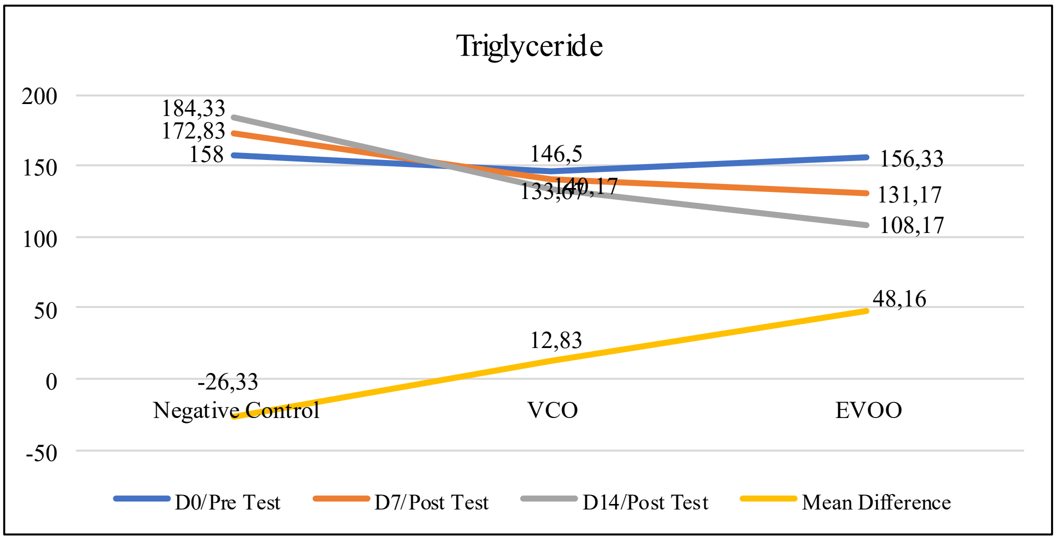


**Figure 2. Chart of triglyceride levels in all groups**

Based on Figure 2, illustrates the changes in triglyceride levels across all treatment groups. The administration of Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) to hyperglycemic obese white rats resulted in a reduction in triglyceride levels. Notably, the group receiving EVOO exhibited a more significant decrease in triglyceride levels compared to the other groups. This suggests that EVOO may be more effective in lowering triglycerides, potentially due to its higher content of beneficial compounds, such as polyphenols and antioxidants, which are known to improve lipid profiles and reduce the risk of cardiovascular issues associated with obesity and hyperglycemia.

**Comparison of total cholesterol and triglyceride levels**

Table 3 presents a comparison of total cholesterol and triglyceride levels across different treatment groups at three time points: Day 0 (D0), Day 7 (D7), and Day 14 (D14). At D0, the negative control group exhibited the highest mean total cholesterol level at 193,67 ± 33,22 mg/dL, while the VCO and EVOO groups had lower levels of 174,67 ± 25,169 mg/dL and 179,00 ± 27,821 mg/dL, respectively, with no significant differences (p-value = 0,507). For triglycerides, the negative control group also had the highest mean at 158,00 ± 21,194 mg/dL, compared to 146,50 ± 18,328 mg/dL for VCO and 156,33 ± 20,849 mg/dL for EVOO (p-value = 0,577).

By D7, the negative control group showed a significant increase in total cholesterol (204,17 ± 29,08 mg/dL, p-value = 0,030) and triglycerides (172,83 ± 18,104 mg/dL, p= 0.005). In contrast, both VCO and EVOO groups demonstrated reductions in total cholesterol, with EVOO showing a notably lower level of 155,50 ± 27,275 mg/dL. By D14, the negative control group continued to rise in both total cholesterol (213,67 ± 29,08 mg/dL, p= 0,001) and triglycerides (184,33 ± 22,429 mg/dL, p-value = 0,001). Conversely, the VCO and EVOO groups exhibited significant decreases in total cholesterol, with EVOO achieving the lowest level at 130,83 ± 24,807 mg/dL, and triglycerides, with EVOO also showing a significant reduction to 108,17 ± 17,612 mg/dL. Overall, the data indicate that both VCO and EVOO effectively lower cholesterol and triglyceride levels, particularly by Day 14, with EVOO demonstrating superior efficacy.

**Table 3. Comparison of total cholesterol and triglyceride levels in all groups**

| Time | Treatment Group | Total Cholesterol | | Triglyceride | |
|---|---|---|---|---|---|
| | | Mean ± SD | p-value | Mean ± SD | p-value |
| D0 | Negative Control | 193,67 ± 33,22 | 0,507 | 158,00 ± 21,194 | 0,577 |
| | VCO | 174,67 ± 25,169 | | 146,50 ± 18,328 | |
| | EVOO | 179,00 ± 27,821 | | 156,33 ± 20,849 | |
| D7 | Negative Control | 204,17 ± 29,08 | 0,030 | 172,83 ± 18,104 | 0,005 |
| | VCO | 173,17 ± 29,451 | | 140,17 ± 21,526 | |
| | EVOO | 155,50 ± 27,275 | | 131,17 ± 17,759 | |
| D14 | Negative Control | 213,67 ± 29,08 | 0,001 | 184,33 ± 22,429 | 0,001 |
| | VCO | 162,83 ± 32,015 | | 133,67 ± 22,241 | |
| | EVOO | 130,83 ± 24,807 | | 108,17 ± 17,612 | |

Note: *One Way Anova, significant if p-value <0,05

**Effect of Virgin Coconut Oil (VCO) on Lipid Profiles**

The administration of Virgin Coconut Oil (VCO) for 14 days in hyperglycemic obese rats led to a 6,77% reduction in total cholesterol levels, decreasing from 174,67 mg/dL before treatment to 162,83 mg/dL after treatment. Triglyceride levels also showed a decrease of 8,75%, from 146,50 mg/dL to 133,67 mg/dL. These results indicate that VCO has a modest but significant effect on improving lipid profiles in hyperglycemic obese rats, which aligns with previous studies reporting the lipid-lowering effects of VCO, especially in hyperlipidemic or diabetic conditions (Dewi et al., 2022; Venty et al., 2017). VCO's impact on lipid metabolism can be attributed to its medium-chain fatty acids (MCFAs), particularly lauric acid. Lauric acid is known to enhance fatty acid oxidation and increase energy production, which may prevent fat accumulation in the liver and improve lipid profiles. Moreover, the high polyphenol content in VCO, such as ferulic acid, can modulate lipogenesis and promote fat breakdown (Eyres et al., 2016; Neelakantan et al., 2020). However, variations in the effects of VCO, based on dosage and duration, have been reported. While VCO may raise total cholesterol in some studies, its effects on triglycerides are typically favorable, particularly in hyperglycemic conditions.

**Effect of EVOO on lipid profiles**

EVOO administration in the same time frame resulted in a more substantial reduction in both total cholesterol and triglyceride levels. By day 14, total cholesterol in the EVOO group decreased by 26,9%, from 179,00 mg/dL to 130,83 mg/dL, while triglyceride levels dropped by 30,8%, from 156,33 mg/dL to 108,17 mg/dL. This significant reduction in lipid levels in the EVOO group highlights its superior efficacy compared to VCO and the control group, which showed an increase in both total cholesterol and triglycerides over the same period. These results are consistent with the well-established hypolipidemic effects of EVOO, which have been shown to lower lipid levels and reduce the risk of cardiovascular diseases (Elsewedy et al., 2022). The lipid-lowering effects of EVOO are primarily due to its high content of monounsaturated fatty acids (MUFA), particularly oleic acid, and polyphenolic compounds such as hydroxytyrosol and oleuropein. Oleic acid plays a pivotal role in reducing liver cholesterol synthesis by modulating HMG-CoA reductase activity, thereby decreasing the production of LDL cholesterol (Mauliza, 2018). Additionally, EVOO's antioxidants protect LDL from oxidation and help reduce inflammation, which is critical in the context of obesity and hyperglycemia, conditions that are often characterized by increased oxidative stress (Fadhilah and Sutysna, 2020). These compounds make EVOO a more effective agent for managing cholesterol and triglycerides, particularly in individuals with obesity and metabolic disorders.

**Comparison of VCO and EVOO effects on lipid profiles**

When comparing the effects of VCO and EVOO on total cholesterol and triglycerides, EVOO demonstrated a more pronounced and consistent reduction in lipid levels. At Day 14, EVOO led to a 26,9% reduction in total cholesterol and a 30,8% reduction in triglycerides, compared to a 6,77% reduction in cholesterol and 8,75% in triglycerides for VCO. This suggests that EVOO is more effective in managing lipid profiles in hyperglycemic obese rats, likely due to its higher polyphenol content and monounsaturated fatty acids. In contrast, while VCO showed a positive effect on lipid profiles, its impact was more modest, and in some cases, its effects were not as pronounced as those of EVOO. This discrepancy can be attributed to the different mechanisms by which the two oils act. VCO, rich in saturated fatty acids (especially lauric acid), may raise HDL cholesterol but also has the potential to increase LDL cholesterol, especially with higher consumption levels (Eyres et al., 2016). EVOO, on the other hand, has been consistently shown to lower both total cholesterol and triglycerides, which are key indicators of cardiovascular risk, largely due to the combined action of MUFAs and polyphenols.

**Study limitations and implications**

Although the results of this study suggest that EVOO is more effective than VCO in lowering lipid levels in hyperglycemic obese rats, there are several limitations. First, the relatively short duration of 14 days may not fully capture the long-term effects of these oils on lipid metabolism. Additionally, the study used a limited sample size of 24 rats, which may affect the generalizability of the findings. Future studies with larger sample sizes and longer treatment durations are needed to further validate these results. Moreover, the doses of VCO and EVOO used in this study may not directly correlate with typical human consumption levels, so translating these findings to clinical practice requires caution. The effects of VCO and EVOO on other metabolic parameters, such as insulin sensitivity and body fat distribution, should also be explored in future research.

## CONCLUSIONS

This study demonstrates that both Virgin Coconut Oil (VCO) and Extra Virgin Olive Oil (EVOO) can effectively reduce total cholesterol and triglyceride levels in hyperglycemic obese rats. However, EVOO appears to be more effective in managing lipid profiles, likely due to its higher content of monounsaturated fatty acids and polyphenols. These findings underscore the potential of EVOO as a dietary intervention for managing hyperlipidemia and improving cardiovascular health in individuals with obesity and related metabolic disorders. Further research is needed to explore the long-term effects of these oils and their potential clinical applications.

## CONFLICT OF INTEREST

The author(s) declare that they have no conflict interest

## REFERENCES


De Santis, S., Cariello, M., Piccinin, E., Sabbà, C., Moschetta, A., 2019. Extra Virgin Olive Oil: Lesson from Nutrigenomics. Nutrients 11(9), 1-17. https://doi.org/10.3390/nu11092085

Dewi, N.P., Hudayah, S., Tuldjanah, M., 2022. Pengaruh Pemberian Virgin Coconut Oil (VCO) Enzimatis terhadap Kolesterol Total Tikus Putih Jantan. Farmakologika Jurnal Farmasi 19(2), 180-190. https://jfarma.org/index.php/farmakologika/article/view/473

Elsewedy, H.S., Shehata, T.M., Almostafa, M.M., Soliman, W.E., 2022. Hypolipidemic Activity of Olive Oil-Based Nanostructured Lipid Carrier Containing Atorvastatin. Nanomaterials 12(13), 1-18. https://doi.org/10.3390/nano12132160

Eyres, L., Eyres, M.F., Chisholm, A., Brown, R.C., 2016. Coconut Oil Consumption and Cardiovascular Risk Factors in Humans. Nutrition Reviews 74(4), 267-280. https://doi.org/10.1093/nutrit/nuw002

Fadhilah, R., Sutysna, H., 2020. Pengaruh Minyak Zaitun dan Olahraga Intensitas Sedang terhadap Kadar LDL pada Tikus (Rattus novergicus L) Galur Wistar yang Diberi Diet Tinggi Lemak. Muhammadiyah Journal of Nutrition and Food Science 1(1), 1-7. https://doi.org/10.24853/mjnf.1.1.1-7

Goyal, R., Singhal, M., Jialal, I., 2023. Type 2 Diabetes. StatPearls Publishing: Treasure Island.

Hesaham, A.S.A., Mattar, M., Kamel, K., Osama, A., Mohammed, H., 2021. Influence of Virgin Coconut and Sesame Oils on Diabetic Male Rats. Egyptian Journal of Nutrition 36(2), 117-148. https://doi.org/10.21608/enj.2021.209231

Khaw, K.T., Sharp, S.J., Finikarides, L., Afzal, I., Lentjes, M., Luben, R., Forouhi, N.G., 2018. Randomised Trial of Coconut Oil, Olive Oil or Butter on Blood Lipids and Other Cardiovascular Risk Factors in Healthy Men and Women. BMJ Open 8, 1-14. https://doi.org/10.1136/bmjopen-2017-020167

Lin, X., Li, H., 2021. Obesity: Epidemiology, Pathophysiology, and Therapeutics. Frontier in Endocrinology 12, 1-9. https://doi.org/10.3389/fendo.2021.706978

Masi, G., Oroh, W., 2018. Hubungan Obesitas dengan Kejadian Diabetes Melitus di Wilayah Kerja Puskesmas Ranomut Kota Manado. E-Journal Keperawatan 6(1), 1-6. https://ejournal.unsrat.ac.id/v3/index.php/jkp/article/view/25183

Mauliza, M., 2018. Obesitas dan Pengaruhnya terhadap Kardiovaskular. Jurnal Kedokteran dan Kesehatan Malikussaleh 4(2), 1-10. https://doi.org/10.29103/averrous.v4i2.1040

Neelakantan, N., Seah, J.Y.H., Dam, R.M., 2020. The Effect of Coconut Oil Consumption on Cardiovascular Risk Factors. Circulation 141(10), 803-814. https://doi.org/10.1161/CIRCULATIONAHA.119.043052

Rohman, A., 2017. Infrared Spectroscopy for Quantitative Analysis and Oil Parameters of Olive Oil and Virgin Coconut Oil: A Review. International Journal of Food Properties. 20(7), 1447-1456. https://doi.org/10.1080/10942912.2016.1213742

Ruze, R., Liu, T., Zou, X., Song, J., Chen, Y., Xu, R., Yin, X., Xu, Q., 2023. Obesity and Type 2 Diabetes Mellitus: Connections in Epidemiology, Pathogenesis, and Treatments. Frontiers in Endocrinology 14, 1-23. https://doi.org/10.3389/fendo.2023.1161521

Schumacher, B.D.O., Preuss, E.M., Vargas, C.G., Helbig, E., 2016. Coconut Oil On Biochemical and Morphological Parameters in Rats Submitted to Normolipidic and Hyperlipidic Diets. Ciência Rural 46(10), 1818-1823. https://doi.org/10.1590/0103-8478cr20141766

Setiati, S., 2015. Buku Ajar Ilmu Penyakit Dalam Jilid 2 Edisi VI. Interna Publishing: Jakarta.

Uli, G.B., Asyahir, S.R., Harti, L.B., 2023. Literature Review: The Effect of Mediterranean Diet on Lipid Profile and Fasting Blood Glucose in Overweight or Obese. Amerta Nutrition 7(1), 139-146. https://doi.org/10.20473/amnt.v7i1.2023.139-146

Vasconcelos, L.H.C., Silva, M.C.C., Costa, A.C., Oliveira, G.A., Souza, I.L.L., Righetti, R.F., Queiroga, F.R., Cardoso, G.A., Silva, A.S., da Silva, P.M., Vieira, G.C., Tibério, F.L.C., Madruga, M.S., Cavalcante, F.A., Silva, B.A., 2020. Virgin Coconut Oil Supplementation Prevents Airway Hyperreactivity of Guinea Pigs with Chronic Allergic Lung Inflammation by Antioxidant Mechanism. Oxidative Medicine and Cellular Longevity 2020(1), 1-16. https://doi.org/10.1155/2020/5148503

Venty, A., Aman, I.G.M., Pangkahila, W., 2017. Efek Pemberian Virgin Coconut Oil (Cocos nucifera) terhadap Dislipidemia pada Tikus Putih (Rattus norvegicus) Jantan Galur Wistar yang Diberi Diet Tinggi Kolesterol. Warmadewa Medical Journal 1(2), 58-65. https://doi.org/10.22225/wmj.1.2.28.58-65

Wijaya, H., Surdijati, S., 2020. Efek Suplementasi Virgin Coconut Oil terhadap Parameter Metabolik dan Antropometrik Tikus Wistar Jantan Obesitas. Journal of Nutrition College 9(1), 20-30. https://doi.org/10.14710/jnc.v9i1.25324