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# The Effect of Combining VCO (Virgin Coconut Oil) and Olive Oil on Blood Sugar Reduction in Diabetes Mellitus Patients in the Baregbeg Ciamis Community Health Center Area

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**ABSTRACT**

Diabetes mellitus is a chronic metabolic disorder that manifests as a persistent elevation in blood glucose levels. This study aims to analyze the effect of a combination of Virgin Coconut Oil (VCO) and Olive Oil on the reduction of random blood glucose (RBG) levels in diabetes mellitus patients in the working area of Baregbeg Health Center, Ciamis. This study uses a quasi-experimental design with a two-group pretest-posttest design. A total of 60 respondents were involved and proportionally divided into the intervention group and the control group. Participants in the intervention group were given a combination of VCO and Olive Oil at a dose of 25 ml/day for 7 days, while the control group continued their daily activities without any additional intervention. Measurement of GDS levels was conducted on the first and seventh days to monitor changes longitudinally. Based on the Wilcoxon statistical test, a statistically significant decrease in blood glucose levels was found in the intervention group with a p-value of 0.001 ($p < 0.05$). On the contrary, the control group tended to experience an increase. It is concluded that the combination of VCO and Olive Oil significantly affects the reduction of blood glucose levels in patients with diabetes mellitus and has the potential to be used as a complementary therapy.

## INTRODUCTION

The primary characteristic of diabetes mellitus is hyperglycemia caused by impaired insulin secretion. This chronic metabolic dysfunction requires comprehensive management to prevent further complications resulting from glucose accumulation in the bloodstream and impaired insulin function. Diabetes mellitus has become a major global health threat, with its prevalence increasing steadily every year. According to the International Diabetes Federation (IDF), in 2021 the global prevalence of diabetes mellitus reached 10.5%, affecting approximately 537 million adults. This figure is projected to continue increasing, reaching an estimated 643 million people by 2030 and 783 million by 2045, highlighting the urgent need for comprehensive management (Sun et al., 2022). Indonesia ranks seventh among countries with the highest number of people living with diabetes, with more than 19 million cases and a continuously increasing trend (Mukti et al., 2023).

The prevalence of diabetes mellitus in Indonesia has shown a significant upward trend. Data from the West Java Provincial Health Office indicated that the number of diabetes mellitus cases increased from approximately 848,000 in 2019 to more than one million in 2020 (Venita Syavera & Muhamad Syazali, 2024). In Ciamis Regency, 13,986 diabetes mellitus cases were reported between January and March 2025. Baregbeg Community Health Center recorded 565 cases, making it one of the areas with the highest prevalence of diabetes mellitus in the regency. This high prevalence indicates the need for comprehensive interventions aimed at controlling blood glucose levels and preventing complications.

Suboptimal management of diabetes mellitus can lead to various microvascular and macrovascular complications, including neuropathy, nephropathy, retinopathy, coronary heart disease, stroke, and gangrene (Yusnita et al., 2021; Rif'at et al., 2023). These complications not only reduce patients' quality of life but also increase economic and social burdens. Therefore, maintaining blood glucose control is essential for preventing disease progression and long-term complications.

Current diabetes mellitus management includes both pharmacological and non-pharmacological approaches. Although pharmacological treatments using oral antidiabetic drugs and insulin have proven effective, long-term use is often associated with side effects and high treatment costs. Consequently, there is growing interest in developing complementary therapies based on natural products that are safer, more affordable, and easily accessible to the public (Safitri et al., 2022).

Complementary therapy using natural ingredients has long been recognized in traditional medicine and has increasingly gained attention within evidence-based modern medical practice. Virgin Coconut Oil (VCO) is pure coconut oil extracted from fresh coconut meat without high-temperature processing or chemical refining. As a result, it retains higher nutritional value and preserves its bioactive compounds (Tari et al., 2021). VCO contains approximately 90% saturated fatty acids, primarily lauric acid, caprylic acid, and capric acid, which belong to the Medium Chain Fatty Acids (MCFA) group. These MCFAs are directly metabolized by

the liver into energy without relying on insulin, thereby potentially helping reduce blood glucose levels (Muriyati, 2021). In addition, VCO contains antioxidants such as polyphenols, vitamin E, and vitamin A, which help protect pancreatic beta cells from oxidative damage (Kusuma & Putri, 2020).

Olive Oil, particularly Extra Virgin Olive Oil (EVOO), is a major component of the Mediterranean diet and has been demonstrated to provide numerous health benefits. Olive oil is rich in monounsaturated fatty acids, especially oleic acid (omega-9), as well as phenolic compounds such as oleuropein and hydroxytyrosol, which possess potent antioxidant and anti-inflammatory properties (Ly et al., 2021). The polyphenol content of olive oil can enhance insulin secretion and improve pancreatic beta-cell function through antioxidant and anti-inflammatory mechanisms (Jiang, 2024).

Although numerous studies have investigated the individual effects of Virgin Coconut Oil and olive oil on blood glucose levels, studies exploring their synergistic effects remain limited. The combination of VCO and olive oil is expected to produce complementary effects in lowering blood glucose levels, whereby the Medium Chain Fatty Acids (MCFA) in VCO enhance energy metabolism independently of insulin, while oleic acid and polyphenols in olive oil protect pancreatic beta cells and improve insulin sensitivity (Utari et al., 2022).

Therefore, this study aimed to analyze the effect of combining Virgin Coconut Oil (VCO) and Olive Oil on reducing Random Blood Glucose (RBG) levels among patients with diabetes mellitus in the working area of Baregbeg Community Health Center, Ciamis. This study is expected to provide scientific evidence regarding the effectiveness of a safe, affordable, and easily accessible natural complementary therapy as an adjunct to conventional diabetes mellitus management.

## METHOD

This study employed a quantitative approach using a quasi-experimental design with a two-group pretest–posttest design. The primary objective of the study was to analyze the effect of a combination intervention of Virgin Coconut Oil (VCO) and Olive Oil on reducing blood glucose levels in patients with diabetes mellitus. During the implementation, research participants were allocated into two groups: the intervention group, which received the specific treatment, and the control group, which served as the comparison group without receiving the intervention.

The study population consisted of all patients with diabetes mellitus registered at Baregbeg Community Health Center, Ciamis Regency. A total of 60 respondents were selected using accidental sampling, with 30 respondents assigned to each group.

This study utilized an observation sheet to measure Random Blood Glucose (RBG) levels using a glucometer. Measurements were conducted twice: before the intervention (pretest) and after the intervention (posttest). The intervention group received a combination of Virgin Coconut Oil (VCO) and Olive Oil according to the predetermined dosage, whereas the control group did not receive the combination therapy.

The research procedure began by explaining the objectives and procedures of the study to the respondents, followed by measuring baseline random blood glucose levels. Subsequently, respondents received interventions according to their respective groups, after which random blood glucose

levels were measured again to assess changes in blood glucose levels.

The collected data were analyzed using univariate analysis to describe respondents' characteristics and bivariate analysis to identify changes in blood glucose levels before and after treatment in both the intervention and control groups. Statistical significance was established at $\alpha = 0.05$.

This study was conducted from December 29, 2025, to January 5, 2026, at Baregbeg Community Health Center, Baregbeg District, Ciamis Regency.

## RESULTS AND DISCUSSION

Research Process

This study employed a quantitative method with a systematic approach using a quasi-experimental design involving pretest and posttest measurements in both groups. The intervention group received a combination of Virgin Coconut Oil (VCO) and Olive Oil, while the control group did not receive the combination therapy.

The research stages included obtaining research permission, selecting respondents based on the inclusion criteria, obtaining informed consent, measuring random blood glucose levels before treatment, administering the intervention, and re-measuring blood glucose levels after the intervention.

Data analysis was performed using the Wilcoxon test to determine the effect of the combination of Virgin Coconut Oil (VCO) and Olive Oil on reducing blood glucose levels among patients with diabetes mellitus in the working area of Baregbeg Community Health Center, while adhering to ethical principles in health research.

Characteristics of Respondents

Table 1. General Characteristics of Respondents

| Gender | Frequency (f) | Percentage (%) |
|---|---|---|
| Male | 22 | 36.7% |
| Female | 38 | 63.3% |
| **Total** | **60** | **100%** |

Age Distribution

| Age | Frequency (f) | Percentage (%) |
|---|---|---|
| < 50 years | 24 | 40.0% |
| ≥ 50 years | 36 | 60.0% |
| **Total** | **60** | **100%** |

Based on Table 1, of the total 60 respondents, most were ≥50 years old, accounting for 36 respondents (60.0%), whereas 24 respondents (40.0%) were <50 years old.

Regarding gender, the majority of respondents were female, totaling 38 respondents (63.3%), while 22 respondents (36.7%) were male. These findings indicate that respondents in the Baregbeg Community Health Center area were predominantly aged ≥50 years and female.

Data Analysis

a. Univariate Analysis

Table 2. Frequency Distribution of the Combination of VCO and Olive Oil in the Intervention Group

Pre-test

| Category | Frequency | Percentage |
|---|---|---|
| Low (<110 mg/dL) | 0 | 0% |
| Normal (110–198 mg/dL) | 0 | 0% |
| High (>200 mg/dL) | 30 | 100% |
| **Total** | **30** | **100%** |

Post-test

| Category | Frequency | Percentage |
|---|---|---|
| Low (<110 mg/dL) | 0 | 0% |
| Normal (110–198 mg/dL) | 6 | 20.0% |
| High (>200 mg/dL) | 24 | 80.0% |
| **Total** | **30** | **100%** |

Table 2, shows that before the intervention (pretest), all respondents (30 respondents; 100%) in the intervention group had high blood glucose levels (>200 mg/dL).

After receiving the combination of Virgin Coconut Oil (VCO) and Olive Oil, the distribution of blood glucose levels changed. During the posttest, 6 respondents (20.0%) experienced a reduction to the normal category (110–198 mg/dL), while 24 respondents (80.0%) remained in the high blood glucose category (>200 mg/dL). These findings demonstrate a change in blood glucose distribution following the intervention, although most respondents remained in the hyperglycemic category.

Table 3. Frequency Distribution of the Control Group

Pre-test

| Category | Frequency | Percentage |
|---|---|---|
| Low (<110 mg/dL) | 0 | 0% |
| Normal (110–198 mg/dL) | 0 | 0% |
| High (>200 mg/dL) | 30 | 100% |
| **Total** | **30** | **100%** |

Post-test

| Category | Frequency | Percentage |
|---|---|---|
| Low (<110 mg/dL) | 0 | 0% |
| Normal (110–198 mg/dL) | 0 | 0% |
| High (>200 mg/dL) | 30 | 100% |
| **Total** | **30** | **100%** |

Based on Table 3, the pretest results of respondents in the control group at Baregbeg Community Health Center showed that all respondents (100%) had high blood glucose levels (>200 mg/dL). The posttest results also indicated that all respondents (100%) remained in the high blood glucose category. Therefore, respondents in the control group did not experience any reduction in blood glucose levels during the study period.

b. Bivariate Analysis

The bivariate analysis was conducted using the Wilcoxon Signed-Rank Test to determine the effect of the combination of Virgin Coconut Oil (VCO) and Olive Oil on blood glucose levels, with a significance level of $\alpha = 0.05$.

Table 4. Wilcoxon Test Results of Pretest and Posttest Following the Administration of a Combination of Virgin Coconut Oil (VCO) and Olive Oil in Patients with Diabetes Mellitus

Intervention Group

| Variable | N | Mean Rank | Sum of Ranks | Z | p-value |
|---|---|---|---|---|---|
| Negative Ranks | 25 | 15.64 | 391.00 | -3.261 | 0.001 |
| Positive Ranks | 5 | 14.80 | 74.00 | | |

Control Group

| Variable | N | Mean Rank | Sum of Ranks | Z | p-value |
|---|---|---|---|---|---|
| Negative Ranks | 8 | 8.75 | 70.00 | -3.342 | <0.001 |
| Positive Ranks | 22 | 17.95 | 395.00 | | |

Based on Table 4, the Wilcoxon test demonstrated a statistically significant difference between the pretest and posttest blood glucose levels in the intervention group following the administration of the combination of Virgin Coconut Oil (VCO) and Olive Oil, with a p-value of 0.001 ($p < 0.05$). Most respondents in the intervention group experienced a reduction in blood glucose levels, as indicated by 25 negative ranks.

Although no intervention was administered, the control group unexpectedly showed a statistically significant difference ($p < 0.001$). However, the majority of respondents experienced an increase in blood glucose levels, as indicated by 22 positive ranks. These findings indicate that supplementation with a combination of Virgin Coconut Oil (VCO) and Olive Oil demonstrated superior efficacy in reducing blood glucose levels among patients with diabetes mellitus compared with the control group.

The statistical significance of this difference further emphasizes the potential role of integrating healthy fats into glycemic management for patients with diabetes mellitus. To compare the mean values of the pretest and posttest measurements between the intervention and control groups, a Paired Samples t-test was performed.

Table 5. Paired Samples t-test Results for the Intervention and Control Groups

| Variable | n | Mean Difference | Standard Deviation | p-value |
|---|---|---|---|---|
| Intervention | 30 | 31.467 | 56.921 | 0.005 |
| Control | 30 | -39.667 | 53.065 | 0.000 |

The paired samples t-test confirmed a statistically significant difference between the baseline and final measurements in the intervention group. These findings validate that the intervention exerted a substantial effect on reducing the target variable among the study participants, with a mean difference of 31.467, $t = 3.028$, and $p = 0.005$ ($p < 0.05$), indicating that the intervention significantly influenced the study outcome.

The effect size, based on Cohen's $d = 0.553$, was categorized as a moderate effect. Similarly, the control group also exhibited a statistically significant difference between pretest and posttest measurements, with a mean difference of $-39.667$, $t = -4.094$, $p < 0.001$, and Cohen's $d = -0.748$, representing a moderate-to-large effect.

Overall, both groups experienced statistically significant changes during the study period. However, only the intervention group demonstrated clinically meaningful changes that could be attributed to the administration of the combination of Virgin Coconut Oil (VCO) and Olive Oil.

## DISCUSSION

### Blood Glucose Levels in the Intervention Group (Pretest)

The findings showed that all respondents (100%) in the intervention group had blood glucose levels exceeding 200 mg/dL during the pretest, indicating a state of hyperglycemia.

This condition is associated with the characteristics of the respondents, who were predominantly women aged ≥50 years, both of which are recognized risk factors for diabetes mellitus due to declining pancreatic beta-cell function and increasing insulin resistance with advancing age.

In addition to non-modifiable risk factors, hyperglycemia is also influenced by modifiable factors, including unhealthy dietary habits, physical inactivity, psychological stress, and poor adherence to treatment.

Therefore, controlling blood glucose levels requires both pharmacological and non-pharmacological interventions, including complementary therapies such as the combination of Virgin Coconut Oil (VCO) and Olive Oil.

### Blood Glucose Levels in the Intervention Group (Posttest)

Following the administration of the combination of Virgin Coconut Oil (VCO) and Olive Oil, changes in the distribution of blood glucose levels were observed in the intervention group.

The posttest results demonstrated that 20.0% of respondents experienced a reduction in blood glucose levels to the normal range, whereas 80.0% remained in the hyperglycemic category.

Although most respondents had not yet achieved normal blood glucose levels, these findings indicate a trend toward improved glycemic control following the intervention. This effect is presumed to be associated with the bioactive compounds present in Virgin Coconut Oil and Olive Oil, which contribute to improving insulin

sensitivity, protecting pancreatic beta cells, and enhancing glucose metabolism.

The less-than-optimal response observed in some respondents may have been influenced by the short duration of the intervention, disease severity, duration of diabetes, adherence to treatment, and uncontrolled lifestyle factors. Nevertheless, no respondents experienced an increase in blood glucose levels, suggesting that the combination of Virgin Coconut Oil (VCO) and Olive Oil may help maintain and reduce blood glucose levels as a complementary therapy for patients with diabetes mellitus.

Effect of the Combination of Virgin Coconut Oil (VCO) and Olive Oil on the Intervention Group

The Wilcoxon test revealed a statistically significant difference between pretest and posttest blood glucose levels in the intervention group ($p = 0.001$; $p < 0.05$), indicating that the combination of Virgin Coconut Oil (VCO) and Olive Oil had a significant effect on reducing blood glucose levels. Most respondents experienced reductions in blood glucose levels following the intervention, as reflected by the predominance of negative ranks.

This effect is likely attributable to the synergistic action of the bioactive compounds contained in Virgin Coconut Oil and Olive Oil, which enhance insulin sensitivity and secretion, improve glucose metabolism, and reduce insulin resistance through antioxidant activity and unsaturated fatty acids.

These findings are consistent with previous studies reporting that consumption of oils rich in unsaturated fatty acids and medium-chain fatty acids can reduce blood glucose levels in patients with type 2 diabetes mellitus.

Blood Glucose Levels in the Control Group (Pretest)

Based on the pretest results, all respondents (100%) in the control group had random blood glucose levels >200 mg/dL, indicating a hyperglycemic condition. There were no respondents with normal or low blood glucose levels. These findings indicate that the baseline characteristics of the control group were comparable to those of the intervention group, thereby supporting the validity of the comparison between the two groups.

The elevated blood glucose levels observed in the control group were influenced by similar risk factors as those in the intervention group. However, respondents in the control group only received standard therapy without the addition of the combination of Virgin Coconut Oil (VCO) and Olive Oil.

These findings suggest that glycemic control in the control group remained poor and required further evaluation and adjustment of therapy to prevent long-term complications.

Blood Glucose Levels in the Control Group (Posttest)

The posttest results demonstrated that all respondents (100%) remained in the category of random blood glucose levels >200 mg/dL, with no change in the distribution compared with the pretest. These findings confirm that no clinically meaningful reduction in blood glucose levels occurred in the control group during the study period.

The absence of supplementation with the combination of Virgin Coconut Oil (VCO) and Olive Oil in this group was associated with the persistence of blood glucose levels above the normal threshold throughout the observation period.

The Wilcoxon test showed a statistically significant difference between the pretest and posttest results ($p < 0.001$). However, this difference reflected a tendency toward increasing blood glucose levels rather than improvement. This condition may be explained by the limited effectiveness of standard therapy alone, treatment adherence, lifestyle-related

factors, and the progressive nature of type 2 diabetes mellitus.

Compared with the control group, the intervention group demonstrated better outcomes, evidenced by a reduction in blood glucose levels. These findings support the effectiveness of the combination of Virgin Coconut Oil (VCO) and Olive Oil as a complementary therapy for reducing blood glucose levels.

Analysis of Blood Glucose Reduction in the Intervention and Control Groups

The findings demonstrated that administration of the combination of Virgin Coconut Oil (VCO) and Olive Oil in the intervention group significantly reduced blood glucose levels ($p = 0.005$) with a moderate effect size (Cohen's $d = 0.553$), indicating both statistical and clinical significance.

This reduction is presumed to result from the synergistic effects of the medium-chain fatty acids contained in Virgin Coconut Oil and the oleic acid and polyphenols present in Olive Oil, which contribute to improving insulin sensitivity and reducing insulin resistance. Although the control group also exhibited statistically significant changes in blood glucose levels during the study period, the reduction that aligned with the objective of the study was observed only in the intervention group.

Therefore, the combination of Virgin Coconut Oil (VCO) and Olive Oil proved to be effective as a non-pharmacological complementary therapy for reducing blood glucose levels in patients with diabetes mellitus, demonstrating 56.6% greater effectiveness than the control group.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this study, the following conclusions can be drawn:

1. There was a significant difference in blood glucose levels in the intervention group before and after administration of the combination of Virgin Coconut Oil (VCO) and Olive Oil, indicating a significant reduction in blood glucose levels.
2. Comparison of the intervention group with the control group demonstrated that the combination of Virgin Coconut Oil (VCO) and Olive Oil was effective in reducing blood glucose levels.
3. The combination of Virgin Coconut Oil (VCO) and Olive Oil had a statistically significant effect on reducing blood glucose levels in patients with diabetes mellitus.

RECOMMENDATIONS

1. For Patients with Diabetes Mellitus

   Patients with diabetes mellitus are encouraged to consider the use of a combination of Virgin Coconut Oil (VCO) and Olive Oil as a safe, affordable, and easily accessible complementary therapy. However, its use should be accompanied by consultation with healthcare professionals as an adjunct to standard medical treatment. Future studies are recommended to involve larger sample sizes and longer intervention periods in order to obtain more comprehensive findings.

2. For Healthcare Institutions

   Baregbeg Community Health Center is encouraged to develop and implement complementary therapy programs utilizing the combination of Virgin Coconut Oil (VCO) and Olive Oil as an adjunctive treatment option to assist in reducing blood glucose levels among patients with diabetes mellitus within its service area.

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