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# Effectiveness of Virgin Coconut Oil (VCO) on Changes in Weight and Height among Under-five Children with Stunting

*Retno Setyo Iswati*[*], *Indria Nuraini*

*Bachelor of Midwifery Study Program at PGRI Adi Buana University, Surabaya*

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CORRESPONDING AUTHOR

Retno Setyo Iswati
Jln Dukuh Menanggal XII/41, Surabaya
retnoiswati@unipasby.ac.id
+6281233404149

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## ABSTRACT

Virgin Coconut Oil (VCO) is a type of vegetable oil that can facilitate the food digestion and nutrients absorption processes. VCO contains ±10% unsaturated fatty acids and ±90% saturated fatty acids. Besides fat, VCO also contains micronutrients. Administering VCO to under-five children with stunting aims to improve metabolic function so as to increase immunity, optimize growth and development and quality of child health status. This study aims to determine the effectiveness of Virgin Coconut Oil (VCO) on changes in body weight and height among under-five children with stunting. This was a Quasi-Experimental study with a Non Equivalent Control Group design. The samples involved 32 under-five children with stunting. The intervention by administering VCO at a dose of 1 X 5 ml before eating in the morning was conducted for 30 days. Data were analyzed using paired t-test. The results of the study found that administration of VCO was not proven to be effective in significantly increasing body weight (p=0.693) and height (p=0.548) among under-five children with stunting (p>0.05).

*Virgin Coconut Oil (VCO) atau minyak kelapa murni adalah salah satu jenis minyak nabati yang dapat mempermudah proses pencernaan makanan dan penyerapan gizi. VCO mengandung asam lemak tak jenuh ±10% dan asam lemak jenuh ±90%. Kandungan VCO selain lemak juga mengandung zat gizi mikronutrien. Pemberian VCO pada balita stunting ditujukan untuk memperbaiki fungsi metabolik sehingga dapat meningkatkan imunitas, mengoptimalkan tumbuh kembang dan kualitas status kesehatan balita Tujuan penelitian ini adalah mengetahui efektivitas Virgin Coconut Oil (VCO) terhadap perubahan berat badan dan tinggi badan pada balita stunting. Penelitian ini adalah metode Quasy-Eksperiment dengan rancangan Non Equivalent Control Group. Sampel yang digunakan adalah balita stunting berjumlah 32 responden. Intervensi pemberian VCO dengan dosis 1 X 5 ml sebelum makan pada pagi hari dilakukan selama 30 hari. Analisis menggunakan paired t-test. Hasil penelitian didapatkan bahwa pemberian VCO tidak terbukti efektif meningkatkan berat badan (p=0,693) dan tinggi badan (p=0,548) pada balita stunting secara signifikan (p>0.05)*

## Introduction

Decrease in the incidence of malnutrition in children under 5 years of age is still a global health problem and a priority for most low-income countries. Globally, 1 in 3 children under 5 years of age suffers from malnutrition, and two thirds of them live in Asia (Van Beekum et al., 2022).

Indonesia is currently having a challenge regarding stunting. Based on the result of the Indonesian Nutrition Status Study (SSGI) the prevalence of stunting among under-five children in 2021 was 24.4%, while the prevalence in East Java was 23.5%, higher than the target set by WHO of <20%. According

to the Indonesian Ministry of Health, the incidence of short or stunted under-five children is determined by measuring the length or height, which is below normal range when compared to the standard (Sandjojo, 2017).

Stunting is a nutritional problem in children which can have a negative impact on the quality of life in an effort to achieve optimal growth and development. Stunting can affect and hinder the process of child development (Tri Siswati, 2018). The problem of stunting also has a negative direct and long-term impact on health which may lead to poor child development, decreased intellectual function which affects children's learning processes at school and at home, while making it difficult for them to get along and play with peers. In addition, there is an increased risk of infection and decreased productivity. The long-term impact on stunting children refers to a higher risk of developing degenerative diseases, such as cancer, diabetes and obesity. Such diseases may occur because the needs for micro and macro nutrients in the body are not met optimally, which further leads to imperfect formation of body cell functions (Sandjojo, 2017).

Providing complementary foods with adequate and balanced nutritional content to under-five children is expected to support their growth and development process. Fat is an important component that needs to be given to stunted under-five children. Virgin Coconut Oil (VCO) or pure coconut oil is a type of vegetable oil that can facilitate the food digestion and nutrients absorption processes. VCO contains ±10% unsaturated fatty acids and ±90% saturated fatty acids which are dominated by lauric fatty acids of around 47% - 53%. The saturated fatty acids in VCO are medium-chain fatty acids which are more easily dissolved and are not stored in the body as fat tissue. Besides fat, VCO also contains micronutrients (Anton Muis, 2019). Administration of VCO to under-five children with stunting aims to improve metabolic function so as to increase immunity, optimize growth and development and the quality of the health status (Berawi et al., 2020). Administering VCO to under-five children with stunting aims to improve metabolic function so as to increase immunity, optimize growth and development and quality of child health status. This study aims to determine the effectiveness of Virgin Coconut Oil (VCO) on changes in body weight and height among under-five children with stunting.

## Methods

This was a Quasi-Experimental study with the Non-Equivalent Control Group Design to reveal causal relationships by involving a control group in addition to the experimental group. The samples involved 32 under-five children with stunting. Measurement of body weight and height used a manual measuring instrument, which will be observed before being given the VCO intervention and re-observed after being given the VCO intervention. The intervention by administering VCO at a dose of 1 X 5 ml before eating in the morning was conducted for 30 days. Data were analyzed using paired t-test.

## Results

**Table 1.** Frequency Distribution of Body Weight Before and After Administration of VCO

| Weight | Pre-test | | | Weight | Post-test | | | P value |
|---|---|---|---|---|---|---|---|---|
| | n | % | Mean | | n | % | Mean | |
| Non-Ideal Weight | 32 | 100 | 9.5 | Wight Gain | 9 | 28.1 | 9.7 | 0.693 |
| | | | | Fixed Weight | 17 | 53.1 | | |
| | | | | Weight Loss | 6 | 18.8 | | |
| Total | 32 | 100 | | | 32 | 100 | | |

Table 1 revealed that before administration of VCO, all respondents had a non-ideal body weight (100%), whereas after administration of VCO, most of the respondents had a fixed body (53.1%), with a p value = 0.693.

**Table 2.** Frequency Distribution of Body Height Frequency Before and After Administration of VCO

| Height | Pre-test | | | Height | Post-test | | | P value |
|---|---|---|---|---|---|---|---|---|
| | n | % | Mean | | n | % | Mean | |
| Stunted/severely stunted | 32 | 100 | 9.8 | Height Gain | 5 | 15.6 | 9.9 | 0.548 |
| | | | | Fixed Height | 27 | 84.4 | | |
| Total | 32 | 100 | | | 32 | 100 | | |

Table 2 revealed that before administration of VCO, all respondents were stunted/severely stunted (100%), while after administration of VCO, most of respondents had a fixed height (84.4%), with a p value = 0.548.

## Discussion

### Weight Before and After Administration of VCO among Under-five Children with Stunting

Based on the data, it can be seen that before administration of VCO, all respondents had a non-ideal body weight (100%), whereas after administration of VCO, most of the respondents had a fixed body (53.1%), with a p value = 0.693.

Growth is a quantitative change regarding the increase in number, size, dimensions at the level of cells, organs, and individuals. Children not only grow physically, but also grow in the size and structure of the organs of the body and the brain. Physical growth can be assessed by weight (grams, pounds, kilograms), length (cm, meters), bone age, and secondary sex characteristics. Body weight is the most important anthropometric measurement to be measured at every opportunity to check the health of children in all age groups (Dhiyan Nany Wigati, 2020).

Body weight is used to diagnose normal or LBW babies. In infancy, body weight can be used to determine the rate of physical growth and nutritional status, unless there are clinical abnormalities such as dehydration, ascites, edema, and the presence of tumors. In babies who are born at term, the birth weight will return on the $10^{th}$ day. The body weight will be 2 times the birth weight for babies aged 5 months, 3 times the weight at 1 year old, and 4 times the birth weight at 2 years old. During preschool-age, the average weight gain is 2 kg/year. Of course, a toddler's weight gain doesn't have to be drastic, on the contrary, it takes place slowly, gradually, and in a proportional pattern every month. An increase in body size means that the growth process is going well and vice versa, a decrease in body size can be a signal of a growth disorder (Hasriany Arifin, 2022).

Fixed body weight or no weight gain can be influenced by many factors, including difficulty in eating, eating only the food they like or lack of variety in the food menu. Children weight gain is indicated by a change in body size. Under-five children are those with the characteristics of rapid growth at the age of 0-1 year, where at the age of 5 months the body weight increases 2 times the birth weight and the body weight increase 3 times the birth weight at the age of 1 year and becomes 4 times in 2 years old. Growth begins to slow down during the pre-school period, with weight gain of approximately 2 kg per year, and then becomes constant until the end (Ika, 2020).

Other researcher explained that stunting among under-five children was due to a lack of food intake and recurring illnesses, especially infectious diseases, which can reduce children's appetite and increase metabolic needs. Children will only eat the food they like or even having difficulty in eating. Such habit is often considered normal, but prolonged eating difficulties will cause problems in the development and growth of children. In healthy under-five children, weight increases annually between 1.4-2.3 kg (Khairun, Nisa Berawi and Muhartono, 2021).

Intake of Virgin Coconut Oil (VCO) which contains medium chain fatty acids (MCFA) increases calorie expenditure and produces a feeling of fullness faster. MCFAs can also serve as useful substitutes for other fats in food to help increase satiety and increase calorie expenditure as well. The fatty MCFA content helps slow gastric emptying. In addition, MCFA is also directly broken down and transported to the liver as fuel. Therefore, VCO is used for energy and is less likely to be stored as fat. The study finding is in line with a study conducted by Ziya Erokay Metin, Pelin BilgicI, et al in 2022, which found the effect of consumption of VCO on hunger suppression along with its potential to lose weight (Metin et al., 2022).

**Height Before and After Administration of VCO among Under-five Children with Stunting**

The study data showed that before administration of VCO, all respondents were stunted/severely stunted (100%), while after administration of VCO, most of respondents had a fixed height (84.4%), with a p value = 0.548.

Height is the measurement from the crown of the head to the soles of the feet. Height growth follows the general type of growth pattern. Ideal height is the range of normal body length according to age and sex. Ideally, the increase in body length from birth to 1 year of age is about 25 cm, from 1 year to 2 years is about 13 cm, and from 2 years to 3 years is about 9 cm. Children aged 4-5 years may not experience too significant increase in body length, for only about 8 cm for one year. Based on the standards set by the Ministry of Health of the Republic of Indonesia which refers to the World Health Organization (WHO), the ideal height for children is differentiated according to age and gender. The ideal height for boys based on their age includes: 1 year old: 72 – 78 cm, 2 year old: 82 – 92 cm, 3 year old: 83 – 95 cm, 4 year old: 84 – 97 cm and 5 years: 85 – 98 cm. On the other hand, the ideal height for girls based on their age includes: is 1 year old: 70 – 78 cm, 2 years old: 80 – 92 cm, 3 years old: 82 – 95 cm, 4 years old: 83 – 96 cm and 5 years old: 84 – 97 cm (Setiawati et al., 2020).

Height gain is influenced by many factors, including age, gender, genetic factors, nutritional intake, the presence of certain diseases and physical activity (Soedjatmiko, 2016). Poor height growth

is closely related to stunting. Under-five children with stunting can experience stunted motor development. A previous study found that there was a significant relationship between stunting and the motor development of children under two years of age (Pantaleon, 2015). Stunting in under-five children can have an impact until adolescence. Lack of cognitive abilities can occur among stunted adolescents. The result of another study further showed that adolescents with stunting were at risk of having less cognitive abilities 18.333 times greater than adolescents who were not stunted (Muliawati et al., 2019).

According to the decision of the Minister of Health No. 1995/MENKES/SK/XII/2010 concerning Anthropometric Standards for Assessment of Children's Nutritional Status, the definition of short and very short regarding nutritional status is based on the index of Body Length for Age (PB/U) or Height for Age (TB/U) which is equivalent with the term stunted (short) and severely stunted (very short). The incidence of short or stunted under-five children is determined by measuring the length or height, which is below normal range when compared to the standard, namely MGRS (Multicenter Growth Reference Study). Under-five children are categorized as short if their z-core is less than -2SD and very short if their z-score is less than -3SD (Ministry of Health of the Republic of Indonesia, 2016). Stunting in under-five children can cause by many factors, one of which is the mother's height (Winda et al., 2021).

**Effectiveness of VCO on Changes in Weight and Height among Under-five Children with Stunting**

The result showed that administration of VCO was not proven to be effective in significantly increasing body weight ($p=0.693$) and height ($p=0.548$) among under-five children with stunting ($p>0.05$).

Weight and height are indicators of child growth. Growth is an increase in the size and number of cells and intercellular tissue, meaning an increase in the physical size and structure of the child's body, especially height. Body weight is more closely related to the nutritional status of children. There are several factors that can affect changes in height and weight in children, including food intake, infectious diseases, and parenting patterns. Infectious diseases can affect nutritional status of children. On the other hand, children with poor will have a weak immune system which will ultimately affect their nutritional status. Parenting patterns in term of behavior and attitudes of mothers or other caregivers in terms of closeness to children, feeding, cleanliness, caring, affection and so on can also have a significant impact to growth and development. Growth in toddlerhood will be one of the determining factors for growth in the next period (Soedjatmiko, 2016).

A previous study revealed that consumption of animal-based foods was a positive predictor of child growth, especially in height and weight (Kavle, JA et al, 2015). Deficiency of various micronutrients definitely affects metabolic processes in the body, including the formation of optimal red blood cells in the delivery of nutrients and oxygen throughout the body. Consumption of VCO processed from natural sources of coconut fruit with various active substances has the ability to improve various metabolic processes and be a solution to metabolic disorders among stunted children (Berawi et al., 2020).

The study finding is in line with a study conducted by Sumitha Arun, Manish Kumar, et al (2019) which reported that oral supplementation of virgin coconut oil (VCO) together with breast milk did not

increase growth parameters or changes in body composition among very low birth weight babies, particularly in weight gain, triceps skinfold thickness, increase in head circumference and body fat percentage (Arun et al., 2019).

In 2022, Bilge, Elvan and Tugne in their study entitled "The effect of coconut oil on anthropometric measurements and irisin levels among overweight individuals" reported that coconut oil administration had no impact on anthropometric (weight, height and BMI) and biochemistry aspects (Meral Koc et al., 2022).

## Conclusions

Our study found that administration of VCO was not proven to be effective in significantly increasing body weight and height among under-five children with stunting. Intake of Virgin Coconut Oil (VCO) which contains medium chain fatty acids (medium chain fatty acids/MCFA) increases calorie expenditure and produces a greater feeling of satiety. Therefore, VCO is used as a source of energy and is less likely to be stored as fat. More studies are needed to include Virgin Coconut Oil (VCO) as functional nutrition in the therapy for under-five children with stunting.

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