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The effect of extra virgin olive oil (EVOO) on fat mass and fat-free mass for breastfeeding mothers (0-24 months) in Makassar City, Indonesia

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Abstract:

BACKGROUND: Extra Virgin Olive Oil (EVOO) is a fat source classified as monounsaturated fatty acid. Previous studies have shown that 47.5% of breastfeeding mothers have less fat intake when compared to the Adequacy of Nutrition Rate (RDA). EVOO consumption can improve the composition of breast milk. However, no research has been found regarding the body composition of breastfeeding mothers after consuming EVOO. This study aims to determine the effect of EVOO on the body composition of breastfeeding mothers 0-24 months.

MATERIALS AND METHODS: The study was conducted at the Sudiang Raya and Tamalanrea Health Centers in Makassar City with a randomized clinical trial design from January to February 2023. The sample was breastfeeding mothers 0-24 months divided into the intervention group (EVOO and Nutrition Education, n = 17) and the control (Nutrition Education, n = 17). Instruments with Bioelectrical Impedence Analysis tools. Data analysis using t-test.

RESULTS: The sample is breastfeeding mothers aged between ≤19 and >35 years. The results of the analysis showed that the average pre-post test, % fat mass (FM) P = 0.426 and % fat free mass (FFM) P = 0.508 (P > 0.05), meant that there was no significant difference. Between the two groups there was no significant difference at the end of the study, %FM P = 0.469 and %FFM P = 0.529 (P > 0.05).

CONCLUSIONS: In the intervention group that was given EVOO, it was possible to maintain%FM and%FFM in the normal percentage range, while in the control group, there was a decrease from the normal to less/low range.

Keywords:

Body composition, breastfeeding, female, human, olive oil

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Introduction

Data from the World Health Organization (WHO) in 2017 reported that the proportion of exclusive breastfeeding globally was 38%. Meanwhile, Susenas data for March 2021 shows that 71 out of 100 babies aged 0-5 months in Indonesia receive exclusive breastfeeding.[1] The proportion of exclusive breastfeeding in South Sulawesi Province, according to Indonesian Nutritional Status Survey (SSGI) data for 2021, shows that 57.1% of infants aged 0-6 months and 52.1% of infants aged 6-24 months are receiving exclusive breastfeeding. The 2021 Health Service survey data shows that the city of Makassar ranks seventh out of 24 regencies/cities

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surveyed for exclusive breastfeeding, with a percentage of 76.68%. Data from two health center in Makassar City in June 2022 found that in the Sudiang Raya Health Center, there were a total of 1097 toddlers, but only 412 toddlers received exclusive breastfeeding and 480 toddlers were breastfed 6-24 months. Meanwhile, at the Tamalanrea Health Center, the total number of toddlers was 633, 77 of whom received exclusive breastfeeding and 280 infants breastfed 6-24 months.

The benefits of breastfeeding are infection prevention, optimal neurodevelopment, limitation of the development of allergies, reduce the risk of obesity, reduction of the risk of diabetes, protection against cardiovascular disease, and asthma, reduced blood pressure and total serum cholesterol in the future, as well as antibodies.[2-11] Exclusive breastfeeding is recommended for 6 (six) months, then continued until the child is 2 years old, accompanied by appropriate additional food (Decree of the Minister of Health Number 450/MENKES/SK/IV/2004 concerning breastfeeding.[1] Fat is the largest source of energy from breast milk (40-55% of total energy), and the largest composition is contributed by fatty acids of 1.2 grams per 100 grams of breast milk.[12-14] However, the dominant fatty acid found in breast milk is oleic acid, a monounsaturated fatty acid (MUFA) of around 34.60-41.93%.[15-17]

The determinants of breastfeeding include parity, delivery process, use of contraception, prolateral feeding, breast care, breastfeeding frequency, mother's nutritional status, food intake, and eating habits. Abnormal nutritional status prevents the mother from producing enough breast milk to meet her baby's nutrition.[13,18,19] The lower protein content of breast milk is affected by the nutritional status of breastfeeding mothers. Whereas the content of fatty acids, specific vitamins, and carotenoid composition in obese women is different from that of thin women, in this case, the composition of the mother's body is related to the quality of breast milk.[20,21] This research is in line with that conducted by Bzikowska-Jura *et al*., 2018 on the relationship between maternal nutrition and body composition with the nutritional quality of breast milk, indicating that maternal body composition is related to the quality of breast milk.[22] Every 1 kg/m^2 increase in body mass index (BMI) is associated with 0.56 g/L fat in breast milk.[23] Other studies also state that high body composition (%fat mass (FM) and BMI) is related to high breast milk composition.[24,25]

Individual body composition can be influenced by age, gender, food intake, and physical activity.[26] The research report by Citrakesumasari *et al*., 2020 states that macronutrient intake in chronic energy deficiency (CED) and normal breastfeeding mothers is different except for fat intake.The study showed that 47.5% of breastfeeding mothers have less fat intake when compared to the Adequacy of Nutrition Rate (RDA).[27] Fat is often regarded as a source of disease, but in fact, not all fat is harmful to the body. In general, the types of fat in food can be distinguished by saturated fatty acid (SFA), MUFA, polyunsaturated fatty acid (PUFA), trans fat, and cholesterol. Among these fats, which are good for the body, are MUFA and PUFA. MUFA or monounsaturated fatty acids are a type of fat in food that is very good for consumption because it can lower cholesterol in the blood. In addition, MUFA can also reduce the risk of coronary heart disease or blockage of blood vessels, regulate body weight, and protect against drug-induced hepatotoxicity. Foods high in MUFAs include vegetable oils such as olive oil, canola oil, peanut oil, safflower oil, and sesame oil. In addition, nuts such as cashews, almonds, pistachios, macadamias, and hazelnuts are high in MUFAs. Avocados, animal fats, and various seeds also have a high MUFA content.[28]

Recent reports have provided evidence that food intake is related to body composition. Regular consumption of olive oil has a positive effect on body composition, including improving the structure and function of muscle tissue.[29-32] Consumption of olive oil and the Brazilian diet can be potential alternatives for increasing lean mass, decreasing body fat, and increasing muscle strength and function.[29,30,32,33] However, another study found that the group consuming olive oil experienced changes in average total body fat, although not statistically significant.[34]

Research related to oleic acid is a series of umbrella studies from Citrakesumasari, where other research is the intervention of extra virgin olive oil (EVOO) on oleic acid levels in breast milk. Consumption of olive oil, which is a food ingredient rich in MUFA (oleic acid), has been shown to affect the risk of breast cancer and can affect the oleic acid content of breast milk in nursing mothers. Regular consumption of EVOO positively impacts body composition, including improvements in the structure and function of muscle tissue. However, research publications have not been found regarding the body composition of breastfeeding mothers after consuming EVOO. Therefore, this study aims to determine whether EVOO administration affects FM and FFM of breastfeeding mothers 0-24 months.

Materials and Methods

Study design and setting

The research was carried out in the work areas of the Sudiang Raya and Tamalanrea Public Health Centers in Makassar City. This research is an experimental research with randomized clinical trial (RCT) design.The subjects in this study were randomly divided into two

study groups. The samples that were collected and met the research criteria were then conducted RCTs in the two groups in this study where the intervention group would receive 20 ml/day of EVOO as well as nutrition education, and the control group would only receive nutrition education. The EVOO intervention lasted 28 days, while nutrition education was carried out once at the start of the study in each group. The dosage and method of administering EVOO include: respondents were given 20 ml of EVOO/day in a plastic bottle. Fill olive oil into the bottle using a syringe. EVOO is taken twice a day in one bottle for 28 days straight.Research begins in January to February 2023.

Study participant and sampling

The population is all breastfeeding mothers with children aged 0-24 months in the work area of the Sudiang Raya Health Center and Tamalanrea Health Center in Makassar City, namely 799 and 748 in each health center. The two Health Centers were chosen because they continued previous research in the same area.

The minimum sample size is determined based on the Dahlan formula,[35] which is as follows:

$$n1 = n2 = 2\left(\frac{([Z\alpha + Z\beta]S}{X1 - X2}\right)^2$$

Information:

n1: Number of samples in the intervention group.

n2: Number of samples in the control group.

Zα: The standard value of α (5%) is 1.64.

Zβ: The standard value of β (10%) is 1.28.

X1-X2: The minimum difference between the mean of the two groups, which is considered significant, is 29.22.[36]

S: The combined standard deviation is 26.[36]

A total of 34 selected samples were divided into two groups based on inclusion criteria, namely breastfeeding mothers aged 0-24 months, healthy breastfeeding mothers, breastfeeding mothers who agreed to participate in the study, were willing to have their body composition measured, were willing to fill out research questionnaires, were in the working area of the health center at during the study, and were not taking additional food or other drugs such as weight gainers technical sampling using Simple Random Sampling. Randomization of group members using an application, and each group consists of 17 people, and considering the possibility of dropping out so that 20% of the minimum sample is taken.

Data collection and tool

This study uses a structured questionnaire with closed and open questions to obtain information about the characteristics of the participants and research data variables. The data collected is in the form of the characteristics of the respondents, namely age, occupation, education, baby's age, weight and height, and food recall. Data is collected and recorded using Alfit, an Android-based application. The independent variable in this study is EVOO. Data analysis used the SPSS statistic 17,0 program tools from IBM company, with paired t-tests to see the difference between the average %FM and %fat-free mass (FFM) breastfeeding mothers before and after the intervention. SPSS is used to determine the variables related to the results of the research conducted.[37]

Ethical consideration

The implementation of this research was carried out with the permission of the Ethics Committee of the Faculty of Public Health, Hasanuddin University, to all respondents who were given a detailed explanation of the actions taken to the respondents before the implementation began. Number 15633/un4.14.1/TP. 01.02/2022.

Variable measurements

Fat mass and fat-free mass

The variables for measuring the percentage of %FM and %FFM used are based on the Bioelectrical Impedance Analysis tool connected to an application on Android.

Statistical data analysis

From Data analysis, the differences were between the intervention group and the control group by independent *t*-test. Data significant if the *P* value was <0.05.

Results

The characteristics of the respondents, namely age, education, occupation, nutritional status of the mother, and age of breastfeeding are presented in Table 1. There were 17 respondents in the intervention group and 17 people in the control group. Based on age, respondents were divided into three age groups, namely ≤19 years, 1 person (2.9%) in the control group, 20-35 years old, 8 people (47.1%) in the intervention group, and 7 people (41.2%).%) in the control group, age >35 years, where the intervention group was 9 people (52.9%) and the control group was 9 people (52.9%). Mother's education was highest in the intervention group, namely tertiary education, with 10 people (58.8%), and the control group, namely high school, with 12 people (70.6%). The majority of the respondents' occupations were housewives in the intervention group of 15 people (88.2%) and the control group of 17 people (100%). According to nutritional status, in

Table 1: Participant characteristics of 34breastfeeding mothers 0-24 months

Characteristic	Respondent group				Total		*P*
	Intervention		Control				
	n=17	%	*n*=17	%	*n*=34	%	
Age							
≤19 years old	0	0	1	5,9	1	2,9	0,587*
20-35 years old	8	47,1	7	41,2	15	44,1	
>35 years old	9	52,9	9	52,9	18	52,9	
Education							
No School	1	5,9	0	0	1	2,9	0,036*
SD	1	5,9	0	0	1	2,9	
Junior High School	2	11,8	1	5,9	3	8,8	
Senior High School	3	17,6	12	70,6	15	44,1	
College	10	58,8	4	23,5	14	41,2	
Occupation							
Private Employees	2	11,8	0	0	2	5,9	0,145*
Housewife	15	88,2	17	100	32	94,1	
Nutritional Status (BMI)							
Thin	4	23,5	2	11,8	6	17,6	0,374*
Normal	8	47,8	12	70,6	20	58,8	
Fat	5	29,4	3	17,6	8	23,5	
Baby Age							
Baby 0-6 Months	9	52,9	6	35,3	15	44,1	0,300*
Babies over 6 Months	8	47,1	11	64,7	19	55,9	

*Chi-Square

the intervention group, the categories of thin, normal, and obese were 4 people (23.5%), 8 people (47.8%), and 5 people (29.4%), respectively. In the control group, the categories of thin, normal, and obese were 2 people (11.8%), 12 people (70.6%), and 3 people (17.6%), respectively. Meanwhile, at baby age, the intervention group with babies 0-6 months was 9 people (52.9%), and babies over 6 months were 8 people (47.1%); in the control group of infants aged 0-6 months 6 people (35.3%) and more than 6 months 11 people (64.7%).

The results of the analysis show that the *P* value of the characteristics of the respondents between the two groups based on the age of the mother, education, occupation, nutritional status, and age of breastfeeding is 0.587; 0.036; 0.145; 0.374; and 0.300. There were no significant differences in characteristics between the intervention group and the control group based on maternal age, occupation, nutritional status, and age of breastfeeding ($P > 0.05$), while education had significant differences ($P < 0.05$).

The distribution of body composition in Table 2 shows the body composition of the pre-test and post-test mothers in the intervention group. At the beginning of the study, the mother's body composition was in the low %FFM category 1 person (5.9%); The ideal category%FM and %FFMwere 14 people (82.4%) and 16 people (94.1%), respectively; and high category in %FM as many as 3 people (17.6%). %FM (P = 0,000) and %FFM (P = 0,000). Meanwhile, at the end of the%FM and%FFMstudies, the low categories were 1 person (5.9%) and 2 people (11.8%); ideal categories, respectively, as many as 13 people (76.5%), 15 people (88.2%). %FM (P = 0,000), and%FFM (P = 0,000).

Table 3 shows the body composition of pre-test and post-test mothers in the control group. At the beginning of the study, the mother's body composition was in the low category %FM (P = 0,000) and %FFM (P = 0,084), namely 1 person (5.9%) and 5 people (29.4%); ideal category respectively 11 people (64.7%) and 12 people (70.6%); and high category in FM as many as 5 people (29.4%). At the end of the study,%FM (P = 0,001) and %FFM (P = 0,000) did not change from the start of the study.

Table 4 shows the average body composition percentage in the intervention group before and after being given EVOO. The results of the analysis showed that the *P* values of %FM and%FFM were 0.426 and 0.508 ($P > 0.05$), respectively, which meant that there was no significant difference in body composition before and after the EVOO intervention in breastfeeding mothers.The average%FM became 28.07 ± 5.17, with the average difference before and after the intervention being 0.20, and the average%FFM became 31.33 ± 2.00, with the average difference before and after the intervention was carried out, namely 0.10.

The control group showed the average percentage of body composition in the intervention group before and after being given education. The average%FM became

Table 2: Distribution of respondents based on fat mass and fat-free mass of pre-test and post-test mothers in the intervention group

Variable	Nutritional status																
	Pre test									Post test							
	Thin		Normal		Obese		Total		*P*	Thin		Normal		Obese		Total		*P*
	n	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	*n*	%	
FM (%)																		
Low	1	25,0	0	0	0	0	1	5.9	0,000	1	25,0	0	0	0	0	1	5,9	0,000
Ideal	3	75,0	8	100	0	0	11	64,7		3	75,0	8	100	0	0	11	64,7	
High	0	0	0	0	5	100	5	29,4		0	0	0	0	5	100	5	29,4	
FFM (%)																		
Low	0	0	0	0	5	100	5	29,4	0,000	0	0	0	0	5	100	5	29,4	0,000
Ideal	4	100	8	100	0	0	12	70,6		4	100	8	100	0	0	12	70,6	
High	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	
Total	4		8		5		17			4		8		5		17		

*Chi-Square

Table 3: Distribution of respondents based on fat mass and fat-free massof pre-test and post-test mothers in the control group

Variable	Nutritional Status																
	Pre test									Post test							
	Thin		Normal		Obese		Total		*P*	Thin		Normal		Obese		Total		*P*
	n	%	*n*	%	*n*	%	*n*	%		*n*	%	*n*	%	*n*	%	*n*	%	
FM (%)																		
Low	0	0	0	0	0	0	0	0	0,000	1	50	0	0	0	0	1	5,9	0,001
Ideal	2	100	12	100	0	0	14	82,4		1	50	12	92,3	0	0	13	76,5	
High	0	0	0	0	3	100	3	17,6		0	0	1	7,7	2	100	3	17,6	
FFM (%)																		
Low	0	0	0	0	1	33,3	1	5,9	0,84	0	0	0	0	2	100	2	11,8	0,000
Ideal	2	100	12	100	2	66,7	16	94,1		2	100	13	100	0	0	15	88,2	
High	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	
Total	2		12		3		17			2		13		2		17		

*Chi-Square

Table 4: Bivariate analysis of average fat mass and fat-free mass in breastfeeding mothers 0-24 months

Variable of body composition	Pre-test (mean±SD)	Post-test (mean±SD)	(Δ)	*P*
% Fat Mass				
Intervention	27,87±5,35	28,07±5,17	↑0,20±1,00	0,426*
Control	27,39±3,52	26,86±4,43	↓0,52±2,40	0,378*
P	0,770**	0,469**		
% Fat-FreeMass				
Intervention	31,43±2,08	31,33±2,00	↓0,10±0,60	0,508*
Control	31,61±1,35	31,72±1,52	↑0,10±0,63	0,501*
P	0,795**	0,529**		

*Paired *t*-test. **Independent Sample *t*-test

26.86 ± 4.43 with the average difference before and after education being 0.52, and the average%FFM became 31.72 ± 1.52 with the average difference before and after education being 0.10. The results of the analysis showed that the *P* values%FM and%FFM were 0.378 and 0.501 ($P > 0.05$), respectively, which meant that there was no significant difference in body composition before and after being given education to breastfeeding mothers.

The results of the independent sample t-testanalysis showed that the *P* values between the two groups, namely%FM and%FFM, were 0.469 and 0.529 ($P > 0.05$), meaning there was no difference in the average body composition between the two groups after the intervention.

Discussion

This research was conducted to see the effectiveness of EVOO administration on the body composition of breastfeeding mothers. Preliminary data showed that there were no significant differences in the

characteristics of respondents between the intervention group and the control group based on maternal age, occupation, nutritional status, and age of breastfeeding ($P > 0.05$), except for education ($P < 0.05$). The majority of respondents in both the intervention and control groups were aged >35 years (52.9%)., The highest education level was tertiary education (41.2%) and high school level (44.1%). The majority of the respondents' occupations were housewives (94.1%). The nutritional status of the majority was in the normal category (58.8%), but several respondents also had underweight/thin and fat nutritional status. Meanwhile, at baby age of breastfeeding, both the intervention group and the control group breastfed fewer babies 0-6 months (44.1%) than those who breastfed more than 6 months (55.9%).

Breastfeeding mothers require a higher intake of nutrients than during pregnancy. Based on Permenkes No. 28 of 2019 Nutritional Adequacy Rates, breastfeeding mothers 0-6 months need an additional 330 kcal of energy, 20 g of protein, 2.2 g of fat, 45 g of carbohydrates, and 800 ml of water. Meanwhile, mothers who breastfeed for 7-12 months require an additional 400 kcal of energy, 15 g of protein, 2.2 g of fat, 55 g of carbohydrates, and 650 ml of water.[38]

Bravi *et al*., 2016 showed that the mother's overall dietary habits during breastfeeding affect the composition of breast milk, and the mother's body composition is related to the quality of breast milk.[18,22] In addition, food intake has also been shown to be related to body composition. Regular consumption of EVOO positively affects body composition, including improvements in the structure and function of muscle tissue.[29,32]

Olive oil is a food source of MUFA, which is a good type of fat in the body, so it is safe for consumption because it can lower blood cholesterol. In addition, MUFA can also reduce the risk of coronary heart disease or blockage of blood vessels, regulate body weight, and protect against drug-induced hepatotoxicity.[28] Research by Handayani *et al*., n.d. has proven the benefits of olive oil for health. Giving EVOO can improve cholesterol levels and reduce fasting blood sugar levels and blood pressure; therefore, it can be used as an herbal medicine to prevent coronary heart disease.[39]

In this study, the nutritional status of the dominant respondents was in the normal category, namely 20 people (58.8%), 8 people fat (23.5%), and 6 people thin (17.6%). The average percentage of FM and FFM respondents is in the normal category when compared to the standard, namely FM between 20-30% and FFM between 30-33%.[26]

Effect of EVOO on FM and FFM of breastfeeding mothers

The results of this study indicated that there were no significant differences in body composition before and after being given EVOO in each category of body composition for breastfeeding mothers ($P > 0.05$). There was no significant difference because in this study the sample was dominated by breastfeeding mothers with normal nutritional status, and the average %FM and %FFM were in the ideal category in the intervention and control groups. The majority of respondents had an average %FM and %FFM in the normal category, both before and after the intervention, in the two groups of respondents. This shows that consumption of EVOO within 28 days did not cause a significant change in %FM and %FFM. The analysis results show the *P* value of %FM (0.426) and %FFM (0.508). This aligns with research conducted in Goias, Brazil, which showed no significant difference in body fat percentage before and after the EVOO intervention ($P = 0.303$).[34] There was also no increase in FFM in the intervention group because the intervention, namely giving 20 ml of EVOO, was not applied simultaneously with physical activity interventions, such as resistance training. Another important finding is that EVOO alone cannot increase the respondent's muscle mass parameters. Muscle mass is influenced by the level of energy and protein adequacy. The level of energy and protein adequacy which is a deficit, causes a decrease in muscle mass. Morton *et al*., 2018 explained that protein supplementation significantly increases changes in muscle strength and size in healthy adults.[40]

Research conducted by Anderson-Vasquez *et al*., 2015, compared the effects of DietSAT and EVOO on body composition during a 28-day intervention in postmenopausal women. There were no significant differences in anthropometric measurements on the two diets. However, after the intervention, the EVOO group showed that the average body composition (waist circumference, abdominal circumference, biceps skin folds, subscapular, body fluids, and FFM) was lower than the DietSAT group. Meanwhile, the triceps fold, body fat, and visceral fat were higher in the EVOO group than in the DietSAT group.[41]

Another study looked at the effects of EVOO supplementation and a traditional Brazilian diet (DieTBra) in very obese adults. The results show that DieTBra and EVOO positively affect bone health in very obese adults.[42] In the DieTBra + olive oil group, there was also significant weight loss (0.001). ANCOVA analysis showed decreased total body fat in the DieTBra (0.016) and DieTBra + olive oil (0.004) groups. However, whether these changes were caused by the EVOO intervention or other diets was not explained, because other fat intakes are consumed and not observed.[34]

As with the intervention and control groups, the results of the independent *t*-test analysis did not show a significant difference either at the beginning or at the end of the study ($P > 0.05$). Although statistically, there was no difference in%FM and%FFM between the intervention group and the control group, and there was a tendency that the intervention group that was given EVOO could maintain%FM and%FFM within the normal percentage range, whereas in the control group, there was a decrease from the normal range to low.

The study's results in the intervention group found a sample of 11 people with%FM within the ideal range, both before and after intervention. This shows that giving EVOO can maintain the%FM of breastfeeding mothers in the ideal range. However, there were breastfeeding mothers who had high and low%FM categories both before and after the intervention, and this indicated that giving EVOO 20 ml/day for 28 days and nutrition education had not been able to improve%FM from high to ideal. Whereas in the control group, there were 14 people with %FM and 16 people with%FFM in the ideal range before the intervention, but after the intervention, one sample experienced changes in%FM and%FFM from ideal to low. In addition, three samples had a high%FM category, both before and after intervention.

Changes in body weight and FM in response to the metabolic burden of lactation vary widely among the world's population. Breastfeeding affects the mother's weight and body composition over time, but the differences between exclusively and non-exclusively breastfeeding mothers were not statistically significant. Despite hormonal differences in exclusively and non-exclusively breastfeeding mothers, only short-term differences were observed regarding postpartum body composition changes. Patterns of local fat deposition and transfer did not differ between exclusively and non-exclusively breastfeeding mothers in many studies.[12,43,44]

This study did not show significant changes in body composition after the EVOO intervention, so this can be used as an alternative to increasing the quality and quantity of mother's milk. EVOO or olive oil is an oil with a high source of oleic acid where the components in breast milk contain fatty acids with oleic acid being the dominant one compared to other fatty acids. Fatty acids have benefits for fetal growth, as well as brain and retinal development during pregnancy in the early years of life.[15] While oleic acid in breast milk functions to improve the growth and development of infants, as immunity, and functions as an anti-cancer. Oleic acid functions for formation, brain development, transportation, and metabolism, and antioxidants that can inhibit cancer, become a source of energy, and lower cholesterol levels. This is inseparable from the food intake of breastfeeding mothers, which will improve the nutritional quality of breast milk.[45-47]

Research conducted by Butts *et al*., 2018 in New Zealand showed that the fat composition in breast milk mainly was contributed by fatty acids of 1.2 grams per 100 grams of breast milk.[12] Sánchez-Hernández *et al*., 2019 found that oleic acid was the dominant MUFA acid at 41.93% in breast milk.[15] The levels of oleic acid found in breastfeeding mothers of Asian ethnicity were 1.5 g/L, 1.2 g/L for Maori and Pacific Islanders, and 1.2 g/L for European New Zealanders. Meanwhile, in Indonesia, available data shows that breast milk oleic acid levels are still lower than in other countries, namely 0.95-1.00 g/L.[12]

The level of oleic acid, a high MUFA in breast milk, is associated with a higher amount of MUFA intake than other fatty acids, especially those from olive oil.[15,17,48]

Limitation and recommendation

This research was conducted on humans, not animals, so, such as food intake and physical activity, cannot be controlled. Limitations of the research include the mother's honesty and compliance in consuming the EVOO that was given, the time for measuring body composition was not the same for some respondents due to lack of equipment and personnel, and the location of the respondent's residence, which was far from reach so it is possible that this could influence the measurement results. The low dose of olive oil given and the long intervention period could also cause no changes in body composition in some samples in this study.

Based on the research results obtained, it is recommended to conduct further research by comparing the effect of MUFA and PUFA sources on breastfeeding mothers. follow-up research with a longer intervention period and with a sample of breastfeeding mothers with obese nutritional status. The results of this research can be used as a reference in consuming EVOO for breastfeeding mothers to improve the quality and quantity of breast milk.

Conclusions

The results showed no significant difference b and after EVOO intervention in the %FM and %FFM of breastfeeding mothers 0-24 months in Makassar City. This is probably caused by the initial data where most samples had normal nutritional status and the average%FM and%FFM were ideal, so the changes that occurred were in significant. However, there was a tendency for the intervention group that was given EVOO to maintain%FM and%FFM in the normal

percentage range, while in the control group, there was a decrease from the normal to low range.

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Conflicts of interest

There are no conflicts of interest.

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