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OLEIC ACID LEVELS IN BREASTFEEDING (0-24 MONTHS) AND DETERMINANTS THAT AFFECT IT: LITERATURE REVIEW

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Abstract

This paper presents the results of a literature review on Oleic Acid Levels in Breast Milk and its Determinants. The search refers to the Preferred *Reporting Items for Systematic Reviews* (PRISMA) guidelines. The literature in this study is accessed from scientific article sites that have open access, such as Hurzing Publish or perish, with a selection of Scopus-indexed journals obtaining 200 articles, indexed Google Scholar 1154 articles, Cochrane Library 67 articles, PUBMED 97 articles, CINAHL 110 articles, MEDLINE 47 articles and after going through the article extraction process, followed by the extraction technique, The strategy used is the PICOS framework of this article then in the related further analysis title and abstract and obtained 16 eligible articles. Various forms of intervention have been carried out. To increase exclusive breastfeeding. Expanding the knowledge of mothers and families about the content of breast milk, especially oleic acid, can prevent cancer. Several articles found that providing knowledge about the content of breast milk, such as oleic acid, can increase breastfeeding exclusively.

Keywords: Olic Acid, Exclusive Breast Milk, Breastfeeding Mothers

Introduction

The World Health Organization (WHO) actively promotes breast milk (ASI) as the best source of nutrition for babies and continues to increase the rate of exclusive breastfeeding for the first six months to two years and reach at least 50% by 2025. WHO recommends that one of the most effective ways to ensure a child's health and survival is to give breast milk (ASI) (WHO & UNICEF, 2017).

The results of the 2022 National Socio-Economic Survey (Susenas from the Central Statistics Agency (BPS) in Indonesia show that the coverage of exclusive breastfeeding for infants < 6 months old is 72.04%, (Badan Pusat Statistik, n.d.). Indonesia's health profile in 2019 shows

that nationally, the coverage of exclusive breastfeeding for infants is 76.74%, while for East Kalimantan province, it is 78.53% (Kemenkes RI, 2019).

Low breastfeeding is a threat to children's growth and development. Breast milk (breast milk) is the best source of nutrients for newborns, and its unique composition of nutrients and other substances has been associated with adequate growth and development in breastfed infants. (Bardanzellu et al., 2018; Schlatter et al., 2019). Breast milk can prevent infections such as rotavirus, diarrhea and hand-foot-and-mouth disease in infants (Didehbani et al., 2016). A study in Chile 2018 showed that breastfeeding emerged as a protective factor. In addition to infectious diseases, long-term breastfeeding reduces the risk of obesity, diabetes, and cardiovascular disease (Leonnerdal, 2016). The group that was breastfed from 3 to 6 months had a lower prevalence of obesity and metabolic syndrome components than the group from 0 to 3 months.

Breast milk has a complex composition; in addition to nutritional content related to growth and development and the content of antibodies and HMOs related to immunity, breast milk also has peptide content, including oleic acid and alfa lactalbumin which are anti-cancer components and have a therapeutic effect that has been published under the name *human milk complex of alpha-lactalbumin and oleic acid* (HAMLET) (Hallgreen, 2008*)*.

Intensive fatty acid metabolism, especially in liver cells, the most important of which is fatty acid degradation, is β-oxidation within the mitochondria. Oleic Acid's oxidation mechanism occurs the same as β-oxidation for unsaturated fatty acids. Oleic acid is the starting point for synthesizing many other unsaturated fatty acids through elongation and desaturation reactions. The results of the research by Citrakusumasari et al. (2020) showed that the average oleic acid level in the breast milk of breastfeeding mothers aged two weeks to 6 months with the nutritional status of the SEZ was 1.00 ± 0.37 and the average dietary status of breastfeeding mothers was 0.95 ± 0.36. (Citrakesumasari et al., 2020). The results of the study showed that the average level of oleic acid levels in the breast milk of breastfeeding mothers aged 6 months-12 months was found to be no significant difference in mothers with normal nutritional status and KEK nutritional status, and the level was found to be lower than existing studies. (Citrakesumasari & Muhrifan, 2020).

The results of the study by Citrakusumasari et al. (2020) also found that the oleic acid level was high in breastfeeding mothers with a normal nutritional status of 2.3 g/L, while in the nutritional status of KEK, the oleic acid level was high at 1.8 g/L and 1.6 g. / L. This shows that the mother's nutritional status does not affect the oleic acid level in breast milk. This can explain the importance of breast milk as the primary food source even in conditions of poor nutritional status (Quinn et al., 2012). In addition, Kominiarek & Rajan (2016) explained that the production, quality and quantity of breast milk are not affected by weight loss during breastfeeding, BMI, body fat percentage, and weight gain during pregnancy (Citrakesumasari et al., 2020).

Oleic acid, or Z-Δ9-octadecenoic acid, *is an* unsaturated fatty acid widely contained in olive oil. The composition of fatty acids in breast milk has almost the same content as palm oil (Oleic Acid 36.5% and Palm Oil 36.3%). In contrast, the difference in saturated fat content

between crude palm oil, coconut kernel oil, and coconut oil is quite significant, namely 41%, 81%, and 86%, respectively.

Breastfeeding is more than just providing optimal baby nutrition. It offers a wide range of psychological benefits for both the baby and the mother, providing one of the earliest opportunities to facilitate the mother's awareness of her baby's needs and vice versa. The act of breastfeeding promotes a hormonal process that induces the release of oxytocin, an important hormone associated with maternal bonding and weakens the cortisol response to stress, which, when consistently high, is one of the most vital risk factors for psychological developmental disorders. (Rivi et al., 2020).

Other research suggests that breastfeeding difficulties and lack of confidence in breastfeeding are reported as common problems for mothers with postpartum depressive symptoms. Dennis and McQueen indicate that the underlying factors in the relationship between breastfeeding duration and postpartum depression are multifactorial. In other words, it is possible that the interaction between maternal negative cognition and mother-baby interaction disorder, in addition to other factors, such as underlying physiological processes, are responsible for the appearance of postpartum depression. In addition, depressive symptoms in the early postpartum period result in mothers being more prone to feelings of low self-esteem and self-efficacy. As a result, depressive symptoms and accompanying negative cognition may reinforce breastfeeding difficulties or may reduce the mother's ability to interpret baby cues and breastfeeding difficulties accurately. As a result, depressed mothers often report lower breastfeeding self-efficacy and tend to breastfeed less or for shorter periods. (Pope & Mazmanian, 2016).

The addition of nutritional intake to breastfeeding mothers is carried out so that mothers get additional calories during the breastfeeding process needed for breast milk production. However, an imbalance of both advantages and disadvantages will impact the health of the mother's body. This can be a consideration for Indonesia in determining the intake needs of breastfeeding mothers (Marangoni et al., 2016; Kominiarek & Rajan, 2016). Another study conducted by Czosnykowska- Łukacka et al. (2018) revealed that lactation is a dynamic process and the variability of macronutrient content in breast milk is considerable and influenced by many factors, one of which is the daily intake of maternal food but has minimal effect on the quality and quantity of breast milk. Breast milk (Citrakesumasari et al., 2020).

Problem Identification

There is still limited research on the level of Oleic Acid in the breast milk of breastfeeding mothers in Indonesia; the existing data only exists in Makassar City in 2 working areas of the Health Center. What is the level of Oleic Acid in the breast milk of breastfeeding mothers in other regions in Indonesia, including Samarinda? The diversity of food and eating habits and cultures in each area in Indonesia varies significantly, which may affect the amount of oleic acid intake of breastfeeding mothers and whether there is an effect of nutritional interventions on the level of oleic acid in the breast milk of breastfeeding mothers (0-24 months), as well as how determinants affect the level of oleic acid in the breast milk of breastfeeding mothers.

Purpose of the Literature Review

Find, summarize, collect and systematically analyze reviews of articles relating to oleic acid levels in breastfeeding breast milk (0-24 months) and the determinants that affect them.

Question

a. What is the level of oleic acid in breast milk of breastfeeding mothers (0-24 months)?
b. Does the intake of breastfeeding mothers affect the level of oleic acid in the breast milk of breastfeeding mothers (0-24 months)?
c. Does the body composition and mental health of breastfeeding mothers affect the level of Oleic Acid in breastfeeding mothers (0-24 months)?

Method

a. Search Strategy

The process of searching for electronic-based articles to get sources that are by the keywords *breast milk, breastfeeding,* lactation, micronutrients, *and oleic acid, namely by searching for the Harzing Publish or Perish 7 application, Mendeley, personas ri, web scimago, Google Scholar, and* PUBMED. The application and web can help select journals that Scopus indexes with Q1 or Q2.

The selected article is through the search for *the Harzings Publish or Perish application*. The article is saved with Ris or Mendeley's Reference Manager; then using the Covindence web to select articles that are by the criteria that have been chosen according to the research title, the selected article begins to be input into Covidence to read the title and abstract. After that, if it is by the criteria we have determined and does not meet the requirements for articles in the exam, then the articles we will review will be selected. When including and excluding the article, make sure to re-enter the pdf file because, after that, we read the content of the article to review whether this article meets the criteria determined at the beginning. Articles that cannot be opened because they are not PDF files are then searched through a search of Mendeley's registration account and continued with a more detailed search on Mendeley, the National Library of Indonesia, Google Scholar, PUBMED, Science Direct, Cochrane Library, Proquest, Medline, CINAHL and Embase in the table (Table 1) as follows:

Table. 1. Search Database

Database:
POP, Google Scholar, Cochrane Library, PUBMED, CINAHL, MEDLINE, Publish search years between 2016-2022
Publication language is English
The article keywords are breast milk, breastfeeding, lactation, micronutrients, Oleic acid,
Sample population of breastfeeding mothers 0 – 6 months

b. Preparation of Review Literature

The design or design of this review uses the literature review method with the approach of documenting search strategies and matrix methods to ensure a systematic framework for

article collection, organization and analysis of the application of Systematic Reviews Meta-Analyses (PRISMA) guidelines (Moher et al., 2009) To strengthen the review of the credibility of the report.

Inclusion and Exclusion Criteria

1) The inclusion criteria began with a search for articles published in English journal reviews on breastfeeding between 2016 and 2022 (the last six years)—search keywords: breast milk, breastfeeding*, oleic acid.*
2) Exclusion criteria: Articles not using English will be removed. Case studies, books, policy summaries or theses are excluded from the review

3) Data Extraction

Sixteen articles were reviewed in the complete text, followed by data extraction in the systematic review (first author, year of publication, design, population, intervention, outcome.

a. Search Flow

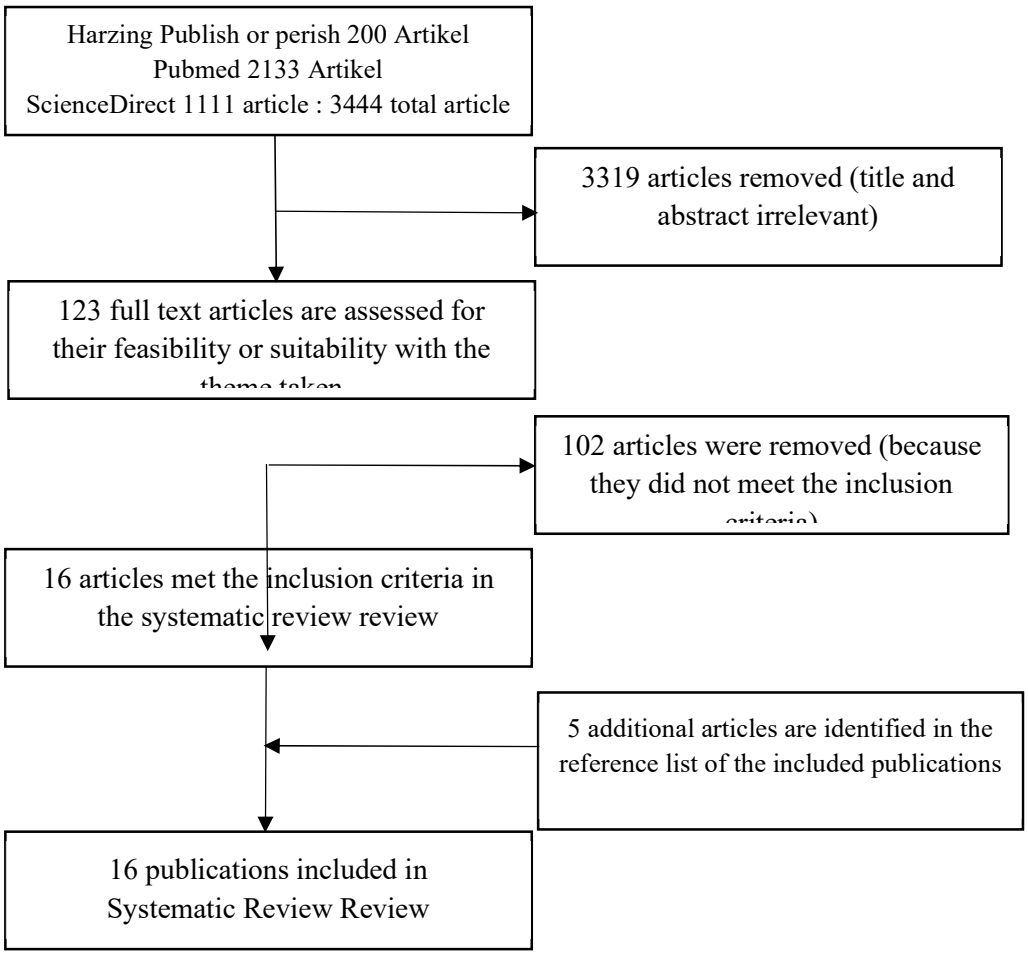

Chart 1. Article browsing flow

Results

Table 1. Synthesis research results

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Differences in oleic breast milk acid levels in the nutritional status of breastfeeding mothers with KEK and normal nutritional status (Citrakesumasari & Muhrifan, 2020)	Breastfeeding mothers and Number of Breast Milk Samples 19 Nutrition Cake and 19 Normal Nutrition Moms	Cross-sectional Study	Manwithney test		As an anti-inflammatory, oleic acid affects autoimmune and chronic inflammatory diseases, although findings are sometimes conflicting.
	Konsentrasi Alfa-lactaalbumin dan Oleic Acid Pada ASI Matur berdasarkan status gizi Ibu Menyusui. Citrakesumasari, Indriyasi R, Salam A. 2020	Breastfeeding mothers Number of Breast Milk Samples 163 breastfeeding mothers (2 weeks-24 months)	Cross-sectional Study			Average Oleic acid levels in breastfeeding mothers 1.0
	Human Milk Composition and Dietary	- The number of	Observational	Test the difference between the	Fatty acids are measured	The composition of fatty acids

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Intake of Breastfeeding Women of Different Ethnicity from the Manawatu-Wanganui Region of New Zealand (Butts et al., 2018)	samples is 80, consisting of 54 samples from New Zealand, Europe, Maori and the Pacific 18 people, Asia 8 people		clinics using the ANOVA Test	by the chromatography method	in breast milk is Oleic Acid 1.5 g 100 g breast milk. There is a relationship between the concentration of fatty acids in breast milk and fat consumption.
	Breast milk fatty acid composition and fatty acid intake of lactating mothers in South Korea (Kim et al., 2017)	- Milk samples were obtained from 238 healthy breastfeeding mothers		Micronutrient Analysis of Human Milk	Breast Milk Examination	Fatty acid composition of breast milk with fat intake of breast milk of breastfeeding mothers. Fat intake and nutritional status did not affect the composition of fatty acids in breast milk.

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Fat Intake With Oleic Acid Levels In Breastfeeding Mother's Milk (6 Months - 24 Months) In The Work Area Of Sudiang And Sudiang Raya Public Health Centers Makassar City (Citrakesumasari et al., 2021)	46 breastfeeding mothers	Cross-sectional study	chi-square test		The study's results found that the average level of oleic acid in breast milk of breastfeeding mothers aged 6-12 months and >12-24 months did not differ significantly. The fat intake of breastfeeding mothers that met the adequate category (≥80% AKG) was 52.5%.
	Relationship between Baby Weight with Alfa-Lactalbumin Content in Breast Milk in the Working Areas of	- 178 nursing moms and a large sample of 59 nursing mothers.	Cross-sectional study	the Mann-Whitney test,	Maternal nutritional status (CED and Normal) was obtained by measuring the mother's upper arm	The results showed that alpha-lactalbumin levels differed significantly at each level of toddlers, with the

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Sudiang Raya Community Health Center Makassar City (Citrakesumasari et al., 2019)				circumference (LILA). Breast milk Sampling was carried out from 09.00 to 11.00 WITA. The mother's milk was obtained using an electric breast pump.	highest levels found in children <6 months. However, alfa lactalbumin levels did not vary significantly based on maternal nutritional status.
	Differences in Oleic Acid Levels in Matured Milk 2 Weeks-6 Months in the Nutritional Status of Breastfeeding Mothers with Chronic Lack of Energy and Normal Nutritional Status in the Work Area of Sudiang and Sudiang Raya	Number of Breast Milk Samples 19 nutrition cakes and 19 mothers Normal Nutrition Babies aged 2 weeks-6 months	observational with a cross-sectional	Data were analyzed using the Manwithney test.	Breast milk examination: Only a sample of 5-10 ml of breast milk is taken to see the level of oleic acid in breast milk using the ELISA method.	The nutritional status of breastfeeding mothers was not significantly different from the level of oleic acid in breast milk in breastfeeding mothers.

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Puskesmas, Makassar City (Citrakesumasari et al., 2020)					
	A Comparison of Changes in the Fatty Acid Profile of Human Milk of Spanish Lactating Women during the First Month of Lactation Using Gas Chromatography-Mass Spectrometry. A Comparison with Infant Formulas Sanchez Hernandez et al, 2019)	Sample number of 13 breastfeeding mothers aged 18-40 years	- Gas chromatography research design coupled with spectrometry.			There is 41.93% oleic acid in breast milk.
	Temporal Progression of Fatty Acids in Preterm and	Postpartum mothers are four months postpartum	Longitudinal comparison of fatty acids (FA) from breast milk			Oleic, palmitic, and linoleic acids were the most

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Term Human Milk of Mothers from Switzerland (Khor et al., 2021)	at 12-time points for preterm groups and two months postpartum at eight-time points for term groups.	(HM) of mothers who give birth to full-term babies and premature babies			abundant FAs across lactation in both groups. Premature colostrum contains significantly higher ($p<0.05$) 8:0, 10:0, 12:0, medium-chain fatty acid (MCFA) counts, 18:3 n-3 FA compared to the term group. Premature milk contains 12:0, 14:0, 18:2 n-6, a much higher amount of saturated fatty acids (SFA), and a much higher amount of MCFAs.
	Trans Fatty Acids in Human Milk	70 breastfeeding mothers	cross-sectional study	All values are expressed as	To determine the levels of trans fatty	Dietary data show that the intake of

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	in Latvia: Association with Dietary Habits during the Lactation Period (Aumeistere et al., 2021)			medians ± interquartile ranges and minimum-maximum values. Spearman rank sequence correlation was used to measure the correlation between trans fatty acid levels in breast milk and maternal dietary habits.	acids in breast milk in lactating women and to evaluate how maternal dietary habits affect the composition of trans fatty acids in breast milk.	trans fatty acids among breastfeeding women in Latvia is generally low in food products. Vaccenic and elaidic acids are the most dominant trans fatty acids in breast milk, primarily determined by consuming milk and dairy products.
	Human Milk Composition and Dietary Intakes of Breastfeeding Women of Different Ethnicity from the Manawatu-Wanganui Region of New Zealand	78 mothers (19-42 years old)	Observational study	Breast milk analysis to check macronutrients and micronutrients Kruskal-Wallis non-parametric ANOVA	The women gave three samples of breast milk over one week (6-8 weeks postpartum), Completing a three-day food diary Provide information about	The results showed that alpha-lactalbumin levels differed significantly at each level of toddlers, with the highest levels found in children <6 months.

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	(Butts et al., 2018)				pregnancy and breastfeeding experiences	However, alfa lactalbumin levels did not vary significantly based on maternal nutritional status.
	Maternal Diet and Nutrient Requirements in Pregnancy and Breastfeeding. An Italian Consensus Document (Marangoni et al., 2016)		Systematic review			Even in most industrialized countries, the risk of inadequate intake of specific micronutrients in pregnancy and breastfeeding is high. This is especially true for the Italian population, especially for docosahexaenoic acid (DHA), iron, iodine, calcium,

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
						folic acid, and vitamin D. The risk of not achieving adequate nutrient supply is increased for the directed WUS group.
	Breastfeeding and its Relationship with Reduction of Breast Cancer: A Review (França-Botelho et al., 2012)		Systematic review	Meta-analisis menggabungkan 25.871 kasus varian alfa-laktalbumin.	The duration of breastfeeding is divided into categories of "reproductive factors" and rheumatoid arthritis: prospective 1-6 months, 7-12 months and more than 12 months.	The main component of breast milk that affects cancer risk is alpha-lactalbumin. HAMLET (alpha-lactalbumin and oleic acid complex milk) can induce tumor cell death. HAMLET induces apoptosis only in tumor cells, while usually differentiate

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
						d cells are resistant to its effects
	Pilot study of the effect of EPA + DHA supplementation on the fatty acid profile of erythrocytes and breast milk of lactating women from Sons´on, Colombia (Valencia-Naranjo et al., 2022)	11 breastfeeding mothers	Quasi-experimental study,		Supplementation of EPA (100 mg) and DHA (250 mg) for three months. Consume omega-3 food sources. Anthropometry (weight, height) is performed, and the fatty acid profile of erythrocytes and breast milk is determined by gas chromatography.	It was found that people consumed few food sources of omega-3 fatty acids, and erythrocytes contained little EPA and DHA. Breast milk at the beginning of the research period. After supplementation, there was no significant change in EPA, but there was a substantial increase in DHA in erythrocytes and breast milk. In addition, there was a decrease in the omega-

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
						6/omega-3 ratio. Supplementation with 250 mg of DHA increased its concentration in blood and breast milk to levels close to the recommended average DHA of 0.3%,
	Baseline red blood cell and breast milk DHA levels affect responses to standard dose of DHA in lactating women on a controlled feeding diet (Jackson et al., 2021)	27 women postpartum five weeks	Experiment		Controlled feeding for 10-12 weeks in pregnant, non-pregnant, and lactating women.	Breast milk affects the response to DHA supplementation, with lower levels associated with more significant increases and higher levels with no change or slight decrease.
	Fatty acid composition in the breast milk of Sri	Milk stream samples from 48	cross-sectional study,	Gas chromatography.		The composition of FA from BM from Sri

No	Title, name, year	Population and sample	Study Design	Analysis	Intervention	Result
	Lankan mothers during exclusive breastfeeding (Bandara et al., 2022)	exclusively breastfeeding mothers were collected				Lanka showed wide variation in C8, C18:1t, C18:3n3, C20, C20:3n6, C20:4n6, C22:5n3 and C22:6n3. The amount of arachidonic acid and DHA is high, but the percentage of linoleic and linolenic acid is low.

Discussion

This research uses a literature review research design. The results of the review of articles were 16 based on an article search selection based on the research objective to determine how high the oleic acid levels are in breastfeeding mothers.

Fat intake of breastfeeding mothers

Fat intake is needed for the body, especially for metabolism. Women generally need 60-70 grams of fat food intake; in breastfeeding mothers, the need for fat increases based on the mother's age in the range of 2.2 grams. The results of the synthesis (Butts et al., 2018) The fat intake of breastfeeding mothers based on Breast Milk Nutrition showed no significant difference between mothers of different ethnicities in macronutrient content (protein, fat, carbohydrates, and moisture). Asian breast milk contains much higher levels of polyunsaturated fatty acids (PUFAs), omega-3 (n-3) and omega-6 (n-6) fatty acids, docosahexaenoic acid (DHA), and linoleic acid. Research presented by Nakul et al. (2017) found that the mother's food intake during breastfeeding does not affect the composition or content.

Oleic Acid Levels of Breastfeeding Mothers

Oleic acid (omega 9) reduces the risk of coronary heart disease, type 2 diabetes, hypertension and cardiometabolic. In addition, oleic acid has a protective effect on the development of certain types of cancer, such as colorectal and breast cancer. (Arsic et al., 2017). A research report conducted by Citrakesumasari (2020) revealed that oleic acid levels with fat intake differed between average maternal nutritional intake and KEK maternal nutrition. A study conducted in South Korea by (Kim et al., 2017) It was found that fat intake and nutritional status did not affect the composition of fatty acids in breast milk. The results of statistical tests show a meaningless relationship between the fat intake of breastfeeding mothers and the level of oleic acid in breast milk.

Research conducted by Nakul et al. (2017) found that maternal food intake does not affect breast milk composition. Other studies have also found that determinants of breastfeeding mothers, such as intake and good nutritional status, influence the composition of breast milk. Still, most of these studies have found a weak association or no effect on breast milk content. Initiation of lactation, early birth, and skin contact between mother and baby during the first hour after birth (IMD) can result in an increase in breastfeeding 1-4 months after birth (Jacqueline, 2016). Another factor is the mother's nutritional status; milk production and intake to the baby varies significantly for each breastfeeding time, ranging from 750-850 ml per day.

The results of the SFA report showed an increase of 19 gr/day; the usual group of women aged >18 years was 0.83 gr/day. When calculated, the total energy demand based on the Indonesian AKG 2580 is higher than the European ESFA 2386 (Marangoni et al., 2016). Research conducted in New Zealand for various ethnicities, namely Asian, Pacific and New Zealand's Indigenous European ethnicity, revealed that New Zealand's European ethnic energy and protein intake is higher when compared to Asian and Pacific ethnicity in the *recommended daily intake* (RDI) respectively shows that Asian ethnicity has a reasonably high RDI in energy intake (107%) and protein (145%) when compared to the standard intake category issued in the 2003 Indonesian WNPG, which is 80-110% (Butts et al., 2018).

The results obtained from this study are that the composition or content of breast milk is not affected by the mother's intake during breastfeeding (Nakul K et al., 2017). The quality and quantity of breast milk are also not affected by the malnutrition condition experienced by the mother (Leonnerdal, 1976). The latest findings of a meta-analysis found that maternal fat intake did not affect the fat in breast milk.

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