Macronutrient and Micronutrient Content in Breast Milk

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ABSTRACT

Breast milk is the best source of nutrition for newborns. Breast milk content is composed of water, protein, carbohydrates, fats, vitamins, minerals, antibodies, and enzymes. Breast milk also contains white blood cells and substances that make up the baby`s immune system such as immunoglobulins and lysozyme. The composition of breast milk can change depending on the needs and ages of the baby. Exclusive breastfeeding is recommended by many doctors and other healthcare professionals. One of the factors that influence exclusive breastfeeding is the mother`s knowledge about the content of breast milk. Most breastfeeding mothers do not know the nutritional content of breast milk, both macronutrients, and micronutrients. Breast milk is also rich in immune cells, antibodies, and other bioactive ingredients that help protect the baby from infection until the baby has an effective antibody response in the first few months of life. Breast milk is an ideal nutrient for babies. The mixture of vitamins, proteins, and fats in breast milk can provide the nutrients and calories the baby needs to grow. Babies who have been breastfed for 6 months are more likely to reach their ideal weight. Therefore, the government recommends exclusive breastfeeding for infants up to the age of 6 months.

Keywords: Baby, Breast Milk, Exclusive Breastfeeding, Macronutrient, Micronutrient.

INTRODUCTION

Breast milk is the best source of nutrition for newborns. WHO recommends breastfeeding the baby for up to 6 months from the first hour of birth. IDAI also recommends that babies breastfeed only for the first 6 months to achieve optimal growth and development. The government is also supporting exclusive breastfeeding the Republic of Indonesia Government Regulation No. 33 of 2012 concerning Exclusive Breastfeeding.[1,2]

The importance of breastfeeding for infants younger than 6 months is closely linked to the benefits of 1-week old breastfeeding for non-breastfeeding babies, reducing the likelihood of respiratory infections and increasing the digestion of the newborn during the first week, which is likely to be related to the composition of the colostrum. Some studies have shown the effect of breastfeeding on the intellectual development of both premature and full-term infants. Other studies have shown that premature babies breastfed by the age of 2-5 have better psychomotor development than non-breastfed babies.[3]

Breast milk has the perfect amount of fats, proteins, carbohydrates, vitamins, and minerals the baby needs. Breast milk is also easier to digest and absorb than baby milk or cow milk. Therefore, breast milk is considered to be the main source of nutrition for babies. Breast milk content is composed of water, protein, carbohydrates, fats, vitamins, minerals, antibodies, and enzymes. Breast milk is said to reduce the risk of developing certain illnesses such as diarrhea, ARI, pneumonia, asthma, obesity, and diabetes, judging from its important nutritional components. Breast milk also contains white blood cells and substances that make up the baby's immune system such as immunoglobulins and lysozyme, with a composition that can change according to the baby's age and needs.[4,5]

What is surprising about the content of breast milk is that the properties of this liquid can change depending on the needs of the baby. The level of milk in mothers who give birth to babies with normal gestational age is different from the level of milk in mothers who give birth to premature babies. Over time, the milk content also changes with the age of the baby. The diet is tailored to the needs of the baby at every stage of growth and development. The content of milk released at the beginning of each feeding is rich in water and lactose. On the other hand, at the end of breastfeeding, the milk content is dominated by calories and fat.[2,3]

Exclusive breastfeeding is recommended by many doctors and other healthcare professionals, but according to the Ministry of Health, only about 66.1% will breastfeed in 2020. According to South Sumatra Health Department 2019 Health Profile data, the exclusive breastfeeding range for infants under 6 months of age in South Sumatra has reached the target of only 60.7%. From some data on Indonesia's exclusive breastfeeding range, we can conclude that the Indonesian breastfeeding range is not yet optimal.[6,7]

One of the reasons why the range of breastfeeding is not optimal is the factor of working mothers. According to a 2012 survey, the condition of working mothers did not affect the initiation of breastfeeding but did affect the duration of breastfeeding. Some factors can cause mothers to stop breastfeeding and not be able to keep their breastfeeding time. This includes lack of time to breastfeed, fatigue at work, and inadequate breastfeeding.[6,7]

In addition, the factor that influences exclusive breastfeeding is the mother's knowledge about the content of breast milk. Most breastfeeding mothers do not know the nutritional content of breast milk, both macronutrients, and micronutrients. In society, there are still many assumptions that breast milk is not enough to meet the nutritional needs of infants. Therefore, mothers still provide additional food for infants under 6 months of age. Some mothers even think that formula milk has better nutritional content than breast milk.[6,7]

The following review will discuss the nutritional content of breast milk, both macronutrients and micronutrients, and their benefits for babies.

DISCUSSION

Breast milk (ASI) is an emulsion of fat in the form of globules in water containing aggregates of protein, lactose, and organic salts produced by the alveoli of the breast glands in the mother. Based on the definition of breast milk above, breast milk can be interpreted as a source of food for babies produced by the mother's breast glands with complete nutritional elements to optimally meet the baby's needs.[4]

Two reflexes, the prolactin reflex, and the letdown reflex play a role in the lactation process. During the lactation reflex, the hormone prolactin is released from the anterior pituitary gland and stimulated by PRH (prolactin-releasing hormone) in the hypothalamus. The stimulation of prolactin production depends on the excretion of milk from the breast. The more milk will collect from the breasts, the more milk will produce. The process from emptying the breast to producing milk is called the prolactin reflex. In the letdown reflex, when the baby sucks the mother's breast, the anterior pituitary gland forms prolactin and stimulates the nerves that extend to the posterior pituitary gland. The posterior pituitary gland produces oxytocin. This causes myoepithelial cells to contract around the alveoli, pushing the milk into the tubules and draining more milk. This process is known as the oxytocin reflex or lets down reflex (Figure 1).[4,5,8]

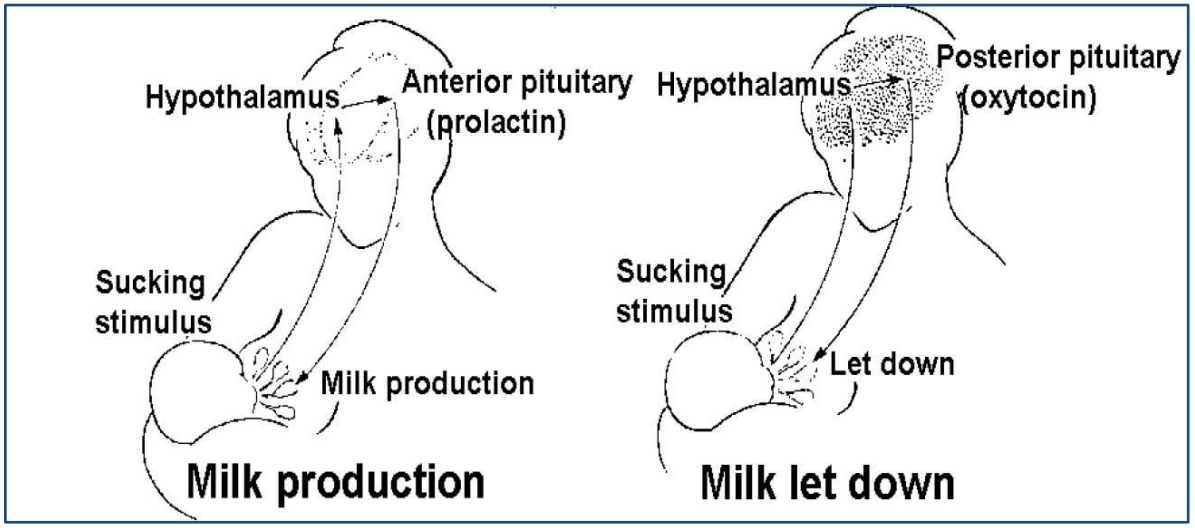

Figure 1. Reflexes on Breastfeeding.[8]

Breast milk contains both macronutrient and micronutrient components. Breast milk consists of 87% water, 1% protein, 4% fat, and 7% carbohydrates. Breast milk also contains many minerals and many vitamins. Compared to cow's milk, breast milk contains less protein (3.5% of cow's milk), in particular a lower proportion of casein. Breast milk is rich in protein (lysozyme, lactoferrin) and non-protein nitrogen fraction (urea, free amino acids including taurine), but does not contain -lactoglobulin.[9,10]

Table 1. The content of several micronutrients in breast milk[9,10]

Micronutrients		**Level/100 mL (µg)**
Vitamin	A	67
	D	0.05
	E	3.15
	K	0.21
	C	3.8
	B_6	93
	B_{12}	26
Mineral	Ca	28
	Mg	3
	Fe	40

The macronutrient content in breast milk meets the energy and calorie needs of infants. Breast milk contains more than 80% water and contains all the water that a newborn needs. Babies who are getting enough breast milk no longer need additional water even if they live in areas with hot temperatures. The protein content in breast milk is quite high and the composition is different from cow's milk protein with the main proteins being whey and casein.

In addition, there are lactoferrin, IgA, and lysozyme. Breast milk contains more and better nucleotides than cow's milk. The fat content in breast milk is sufficient for half the calories for the baby. The main fat in breast milk is triglycerides (98%). Fatty acids in breast milk are mainly palmitic acid, linoleic acid, oleic acid, alpha-linolenic acid, docosahexaenoic acid (DHA), and arachidonic acid (ARA). Breast milk fat is mainly found in hindmilk. The main carbohydrate contained in breast milk is lactose. The lactose content of breast milk is almost 2 times that of lactose in cow's milk or formula, but the incidence of lactose intolerance is less in breastfed babies.[9,10]

Breast milk also contains micronutrients consisting of vitamin K, vitamin D, vitamin E, vitamin A, all B vitamins, and vitamin C. The main mineral found in breast milk is calcium. Calcium levels in breast milk are lower than in cow's milk but the absorption is greater. Other minerals found in breast milk are iron, zinc, and selenium. Minerals in breast milk have better quality and are more easily absorbed than minerals in cow's milk. The content of several micronutrients in breast milk can be seen in table 1.[9,10]

In addition to macronutrients and micronutrients, breast milk contains various bioactive factors such as cells, antibodies, cytokines, growth factors, oligosaccharides, and hormones. Bioactive factors are elements that have an effect on biological processes and have an impact on the function or condition of the body and the health of the baby.[9,10]

Breast milk is made up of water, triglycerides, fatty acids, lactose, proteins, vitamins, and minerals. Breast milk is also rich in immune cells, antibodies, and other bioactive ingredients that help protect the baby from infection until the baby has an effective antibody response in the first few months of life.[4,5,11]

Breast milk is an ideal nutrient for babies. The mixture of vitamins, proteins, and fats in breast milk can provide the nutrients and calories the baby needs to grow. Breast milk is easier to digest than baby food.[4,5,11]

The antibody-rich first milk, colostrum, in breast milk strengthens the baby's immune system and kills large numbers of pathogenic microorganisms. Breastfeeding can also reduce your baby's risk of asthma and allergies. In addition, infants who are breastfed for the first 6 months without infant formula have a lower risk of ear infections, diarrhea, and respiratory illness. Exclusive breastfeeding for 6 months guarantees optimal development of the child's intellectual potential. Babies who have been breastfed for 6 months are more likely to reach their ideal weight. Breastfeeding can prevent sudden infant death syndrome (SIDS) and is also thought to reduce the risk of diabetes, obesity, and cancer in developing babies.[4,5,11]

CONCLUSION

Breast milk is the best source of nutrition for babies up to 6 months of age. Breast milk contains balanced macronutrients, micronutrients, and bioactive factors for babies. The content of breast milk is useful for meeting energy needs, growth, and development, as well as protecting babies from infection and disease. Therefore, the government recommends exclusive breastfeeding for infants up to the age of 6 months.

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