



# Turkish Neonatal Society guideline on nutrition of the healthy term newborn

Türk Neonatoloji Derneği sağlıklı term bebeğin beslenmesi rehberi

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## Abstract

Research shows strong evidence that breastfeeding offers many health benefits for infants and mothers, as well as potential economic and environmental benefits for communities. The World Health Organization recommends breastfeeding exclusively for up to 6 months of age, with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond.

**Keywords:** Breast milk, breastfeeding, lactation, term baby

## Öz

Sağlıklı yenidoğanlar için en uygun beslenme şeklinin kendi annesi tarafından emzirilmesi ve anne sütünün hem bebek, hem de anneye yararlarının yanısıra toplumlara sosyoekonomik ve çevresel yararları olduğuna dair kanıtlar çok güçlüdür. Dünya Sağlık Örgütü bebeklerin doğumdan itibaren ilk altı ay boyunca, su ve başka sıvı ve katı besinler almadan, sadece anne sütü almalarını, altıncı aydan sonra ek besinlerle beraber emzirmenin iki yaş ve ötesine kadar sürdürülmesini önermektedir.

**Anahtar sözcükler:** Anne sütü, emzirme, laktasyon, term bebek

There is a strong evidence that breastfeeding from their own mothers is the most appropriate diet for healthy newborns. If a ranking is made from the most appropriate diet to the least preferred diet, breastfeeding by the mother would be in the first place, followed by an artificial method of delivering her own breast milk (spoon, cup, supplemental nursing devices), followed by donor breast milk and, finally, the use of formula.

The World Health Organization (WHO) recommends mothers to exclusively breastfeed infants for the first six months starting from birth, without water and other fluids and solid foods. WHO also recommends that breastfeeding with additional nutrients after the sixth month must be continued until two years of age (1). According to

the Turkey Demographic and Health Survey (DHS)-2013 results, 58% of 0-1 month-old infants were breastfed exclusively. This ratio decreased to 10% in 4-5 month-old babies (2). Due to the often invalid or correctable reasons such as cesarean section, poor sucking of the baby, low amount of breast milk, and excessive crying, formula support can be given easily. In early discharge, breastfeeding can be easily discontinued and the mother can start supplementary food with the support of her close relatives. For this reason, lactational counseling in the first days of life is particularly important.

## Composition and benefits of breast milk

Breast milk provides nutritional and bioactive components to babies (3, 4):

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### Nutritional content

a. Macronutrients: The approximate amounts of protein, fat, lactose, and energy content of mature term breast milk are given in Table 1 (5):

The whey: Casein ratio (60:40) is high in favor of whey proteins in breast milk protein composition, thus facilitating digestion, and the anti-infective agents found in the whey fraction protects the baby against infections. Although breast milk carries lower levels of protein than cow's milk, the whey protein and alpha lactalbumin-rich protein content, which provide adequate tryptophan levels and amino acid levels, forms the ideal protein composition for infants.

Breast milk fats are the baby's main energy source. Both high levels of unsaturated fatty acids and milk lipase ensure easy and fast digestion. Long-chain fatty acids are found in high amounts in breast milk and are important for brain and eye development (4).

Lactose, the main carbohydrate source of breast milk, facilitates the absorption of calcium, provides the energy necessary for brain growth, and prevents the growth of harmful microorganisms in the intestine (3).

There are dramatic changes in the composition of breast milk within the first month after delivery, and it may show differences among mothers. Also, it varies according to the gestational week, postnatal age, the time of day, maternal nutrition, stage of lactation and from the beginning to the end of each breastfeeding cycle (3-5):

- i. Term breast milk / premature mother's breast milk: The protein, fat and sodium content of the breast milk of mothers who delivered prematurely is higher in the first weeks than that of those whose pregnancies reach full term (Table 2). In the following weeks, the difference is eliminated (6).
- ii. Colostrum / Transitional Milk / Mature Milk: *Colostrum* is the milk that is secreted in the first five days after birth and its amount, appearance, and content is different than mature milk. It is yellowish in color and secreted in small amounts. It is rich in immunologic compounds such as secretory immunoglobulin (Ig)-A, lactoferrin, leukocytes, epidermal growth factor, and minerals such as sodium, chlorine, magnesium and fat-soluble vitamins especially beta-carotene. The low lactose content indicates that the main function is not nutrition but immunologic and trophic. It also facilitates the meconium passage

**Table 1. Energy and macronutrient (gr / dL) composition of breast milk (5)**

Nutrition content	Foremilk	Mature milk
Energy (kcal/L)		650-700
Carbohydrates:		
Lactose (g/L)	20-30	67
Total nitrogen (g/L)	3.0	1.9
Total fat (g/L)	2	3.5

**Table 2. The comparison of premature and term mother's milk (6)**

Nutritional components (Units/L)	Preterm transitional 6-10 days	Preterm mature 22-30 days	Term mature 30 days
Macronutrients			
Total protein, g	19±0.5	15±1	12±1.5
Energy, Kcal	660±60	690±50	640±80
Fat, g	34±6	36±4	34±4
Carbohydrates, g	63±5	67±4	67±5
Minerals			
Calcium, mmol	8.0±1.8	7.2±1.3	6.5±1.5
Phosphate, mmol	4.9±1.4	3.0±0.8	4.8±0.8
Magnesium, mmol	1.1±0.2	1.0±0.3	1.3±0.3
Sodium, mmol	11.6±6.0	8.8±2.0	9.0±4.1
Chloride, mmol	21.3±2.2	14.8±2.1	12.8±1.5
Potassium, mmol	13.5±2.2	12.5±3.2	13±2.0
Trace elements			
Iron, mg	23	22	22
Zinc, micromoles	58±13	33±14	15-46
Copper, micromoles	9.2±2.1	8.0±3.1	3.2-6.3
Manganese, mmol	6±8.9	7.3±6.6	3-6
Iodine, micromoles	–	1.25	–
Vitamins			
Vitamin A, IU	500-4000	500-4000	600-2000
Vitamin D, IU	40	40	–
Vitamin E, IU	2.9-14.5	2.9-14.5	2-3
Vitamin K, IU	0.7-5.3	0.7-5.3	1.2-9.2
Folate, mg	33	33	1.8

with its laxative feature.

*Transitional milk* is secreted between five days and two weeks after delivery and has some characteristics of colostrum. The amount is higher, and the protein content decreases as the lactose, fat and caloric content increases.

*Mature milk* production starts two weeks after birth and reaches its full maturity by 4-6 weeks.

iii. Foremilk / Hind milk: Breast milk composition changes during each nursing session. At the beginning of breastfeeding, foremilk which is rich in carbohydrates is produced, whereas hind milk is rich in fat. It is difficult to estimate when this change occurs during a breastfeeding session; however, the important point is that the baby is able to receive all the nutritional requirements when he/she sucks effectively. If the baby empties the breast and separates from the breast voluntarily, the baby can get the fat-rich hind milk.

b. Micronutrients: The micronutrient content of breast-milk varies according to the mother's nutrition and her nutrient stores (such as vitamins A, B1, B2, B6, B12, D and iodine). The mothers are recommended to take multivitamin support during the lactation period as the mother's diet is not always optimal. Since breast milk vitamin K levels are very low regardless of maternal nutrition, it is necessary to administer 1 mg of vitamin K to newborns soon after birth. Vitamin D levels are also low in breast milk, so it is recommended to be supported in the early period. Although the iron content of breast milk is low, its absorption is very high. Therefore, in exclusively breastfed babies, if the umbilical cord is not clamped early, iron deficiency anemia in the first 6-8 months is rare (4, 7).

c. Water content and taste: the water quantity of breast-milk is high and it is not necessary to give additional water as long as the baby is breastfed, even in the hottest weather. The taste of breast milk varies according to the mother's nutrition. These changes allow the baby to become accustomed to the taste of family food and to facilitate the transition to supplementary foods after the sixth month of age.

### Bioactive content

The bioactive components of breast milk consists of various growth factors and immunologic factors and has different sources. Some are synthesized and secreted by the mammary epithelium; some are produced by cells carried within the milk, while others are drawn from the mother's serum and carried across the mammary epithelium by receptor-mediated transport. In addition, the milk fat globules secreted from the breast epithelium also transport many membrane proteins and lipids to the milk. As many of these factors that are present in breast milk act synergistically, breastfeeding is superior to the supplementation of individual factors (3). The major bioactive factors in breast milk are listed below.

### a. Growth factors

- i. Epidermal growth factor (EGF), a major growth-promoting agent in breast milk, has critical importance in intestinal maturation and healing of intestinal mucosa. Its level in colostrum is much higher than that of maternal serum (3, 4).
- ii. Neuronal growth factors are required for the growth and development of the enteral nervous system (5).
- iii. Insulin-like growth factor (IGF)-I, IGF-II, IGF binding protein and IGF-specific proteases. These factors, which are important in tissue growth, are present in maternal milk (3-5).
- iv. Vascular endothelial growth factor is involved in the regulation of the vascular system.
- v. Erythropoietin is effective in intestinal development and red blood cell production.
- vi. Calcitonin and somatostatin - growth regulating hormones; breast milk contains high levels of calcitonin and its precursor procalcitonin (4).
- vii. Adiponectin and other hormones play a role in the regulation of metabolism and body composition (3, 5).

### b. Immunologic factors

- i. Several cells, such as macrophages, T-cells, stem cells, and lymphocytes in breastmilk provide strong protection against pathogens and stimulate the development of the baby's own immune system. The functions of stem cells are not fully described (3, 4).
- ii. Cytokines and chemokines - cytokines in mother's milk cross the gut barrier and "communicate" with cells and affect immune activities. The cytokines in milk can be classified into two groups as either facilitating enhancing inflammation / protecting against infection or reducing inflammation (3, 4).
- iii. Protection from infection - immunoglobulins (sIgA, IgG, IgM) and molecules known as defensins (lactoferrin, lactadherin, bile salt-stimulating lipase, lysozyme, free fatty acids,  $\alpha$  lactalbumin, mucins, and nucleotides) provide significant protection against infections (3-5).
- iv. Oligosaccharides are prebiotic substances that provide the proliferation of useful organisms. Breast milk oligosaccharides and their protein conjugates serve as a soluble "deceptive" receptor for pathogens and prevent the pathogen from attaching to the intestinal wall. They also form intestinal flora with prebiotic effects. Although for many years it was believed that breast milk was sterile, it is now known that it contains many microorganisms, especially bifidobacteria (8). Breast milk, with its probiotic bacteria and prebiotic oligosaccharides, forms the baby's intestinal flora

in favor of bifidobacteria and lactobacilli in the early period. This natural flora supports the integrity of the intestinal epithelium, reduces permeability, and enhances the pathogen removal, as well as supporting humoral immune response for the formation of sIgA activity. It regulates the infant's immune system permanently in such a way that ends with less inflammation, less atopic, and autoimmune disease. In this way, breast milk permanently affects the immune system at the beginning of life (9, 10).

### **Breast milk and neurocognitive development**

Breastfeeding is also known to have a positive effect on neurocognitive development and intelligence depending on the duration of breastfeeding. This effect is more pronounced in preterm infants, low birth weight and small for gestational age babies (7, 11). This effect is thought to originate from its long-chain fatty acids, but it has not been proven (12, 13). Future studies on new molecules such as choline, ganglioside, and fat globules have gained importance (14).

### **Maternal, neonatal, and environmental risk factors that may cause problems in breastfeeding**

#### **Maternal risk factors:**

History / social factors (first pregnancy, adolescent pregnancy or advanced maternal age, pacifier, bottle feeding, intention to give formula, previous negative breastfeeding experiences and the concerns about the sufficiency of breast milk production) and anatomic / physiologic factors (flat / inverted/large nipple, previous breast surgery, breast abscess, obesity, severe / unhealed sore nipples, delayed lactogenesis, nipple shields) may cause problems in breastfeeding (4, 15).

#### **Neonatal risk factors:**

Medical, anatomic or physiologic (low birth weight / prematurity / multiples, difficulty with latching-on, incorrect positioning to the breast / non-effective sucking, cleft palate / lip, oral anatomic problems such as micrognathia, macroglossia, short frenulum; dyspnea, jaundice, sepsis, neurologic problems, sleepy baby, excessive postnatal weight loss) factors may cause difficulty in breastfeeding (4, 15).

#### **Environmental risk factors:**

The most important risk factors are separation from the mother, using pacifier/formula, the absence of effective sucking at the time of discharge, and early discharge (<48 hours) (15).

### **Most common problems during breastfeeding and recommendations**

#### **Breast refusal:**

##### **a. Reasons:**

The baby may be sleepy, does not suck or sucks poorly, or cannot properly latch on the breast even he is eager, stops draining the breast shortly after starting, becomes angry, starts crying and refuses to suck. There may be several underlying factors: the baby may not be hungry or may be hypothermic, sick or is a preterm. The presence of problems in positioning on the breast, excessive or insufficient milk or nasal obstruction are other reasons for breast refusal (15).

##### **b. Management:**

The above stated reasons must be eliminated. If the baby is restless and "angry," skin-to-skin contact with the mother in a calm environment should be ensured when the baby is not hungry. The baby should not be forced to suck while crying and be cup-fed with expressed milk until they suck from the breast (16, 17).

If the baby is sleepy, the blankets should be opened and the baby should be kept in a more upright position. Gently massaging the baby and talking to them, and trying again after waiting for half an hour may help (15, 16).

#### **Cracked nipples:**

This is the most common breast problem encountered during lactation. Normally breastfeeding is NOT PAINFUL! Some mothers may feel some sensitivity in their nipples after breastfeeding in the first few days; however it disappears in a short time. If the pain is too much or there is a visible injury on the nipple, it should be intervened (17).

##### **a. Causes:**

The causes of cracked/fissured/sore nipples are usually simple and can be prevented. The most common reason is that the baby is not well positioned on the breast. In addition, trying to separate the baby by "pulling" from the nipple, excessive pressure application by the breast pump, Candida infection, and tongue-tie may also cause nipple cracking (17).

##### **b. Management:**

The mother should be given appropriate counselling to regain her confidence in breastfeeding. Positioning the baby in the correct way on the breast is usually sufficient.

Besides non-pharmacologic (lanolin creams and breast-milk, hydrogel dressings) and pharmacologic (anti-fungal creams) methods, nipple protectors are the treatment modalities used to reduce the pain of the mother. There are studies reporting that none has superiority over the others (18). If the tongue-tie's negative effect on sucking becomes definite then phrenotomy could be performed, although it reduces pain in the short term and does not have a positive effect on breast-feeding in the long term (19).

### Inadequate milk

The most common reason for mothers to stop breast-feeding or to start supplemental food is the misperception that their breastmilk is not enough. Especially in the early days, the low amount of colostrum may increase the anxiety of mothers; therefore, it should be explained to the mother that the small amount of colostrum is physiologic and sufficient for her baby in the first days and that certain amount of weight loss after birth is acceptable.

a. Stomach capacity – The newborn baby's stomach capacity is small when born, increases in days (first day 5-7 mL / size of a cherry; third day 22-27 mL / size of a walnut; first week 45-60 mL / size of a pingpong ball; first month 80-150 mL/ size of a large egg) (17).

b. Physiologic weight loss - The maximum loss of fluid in healthy newborns who only receive breast milk occurs on the postpartum 2<sup>nd</sup>-3<sup>rd</sup> days and it is about 7-10% of the birth weight. If the loss of weight is more than 7% at 5-6<sup>th</sup> days, it should be closely monitored. The majority of babies regain birth weight by day 10 to 14, when they are getting enough breastmilk (16, 17).

c. Hypoglycemia - Early and exclusive breastfeeding does not cause symptomatic hypoglycemia because it meets all nutritional and metabolic requirements of healthy term babies. Temporary asymptomatic hypoglycemia, which is frequently seen in the first 2-3 hours after birth in healthy term babies improves by itself without treatment. In addition, the capacity of the neonatal brain to use ketone bodies, also found in breast milk as an alternative to glucose, preserves brain function. For this reason, in healthy, term babies, routine blood glucose measurement in the first hours after birth is not necessary. Blood glucose monitoring should only be performed in babies at risk for hypoglycemia such as prematures, small-for-gestational-age (SGA) babies, intrauterine growth retarded babies, large-for-gestational-age (LGA) babies, infants of diabetic mothers, babies with polycythemia, and in symptomatic babies (5, 7).

d. Inadequate milk - Many mothers are concerned that their babies are inadequately fed although they have enough breast milk. Therefore, the symptoms indicating that the baby does not receive enough breast milk should be well known. These "reliable symptoms" include:

- i. Inadequate weight gain - Inability to reach the birth weight at the end of the postnatal two weeks, less than 500 g weight gain in the postnatal first month (15).
- ii. Inadequate urine output - Less than six times a day, dark colored (pink colored urate crystal), concentrated urine output after the second day of life (17).

The amount of stool and postpartum changes in colour should also be taken into account. Normally, newborn babies defecate 3-8 times a day. A decrease in this number, still passing meconium at the fifth day, may suggest that breastfeeding is inadequate (16, 17).

### Reasons for inadequate breastfeeding:

- i. Inadequate milk production

Common causes: The most common cause of low breast milk supply is a poor latch.

Factors such as late initiation of breastfeeding, infrequent breastfeeding, short breastfeeding, not fully emptied breasts due to pacifier or bottle use or supplemental feeding, can reduce milk production. Psychologic factors (lack of self-confidence, fatigue, anxiety and burnout) may also lead to reduced milk production (7, 17).

Rare causes: Drugs (diuretics, contraceptives) used by the mother, smoking, alcohol, previous breast surgery, placenta residues, heavy malnutrition (16).

- ii. Inadequate milk intake:

The reasons why the baby cannot empty the breast adequately even though the mother has sufficient milk are inefficient latch-on, malpositioning, inappropriate timing and duration of breastfeeding, being ineffective at emptying the breasts without receiving the hind milk, and poor/shallow sucking because of illnesses or prematurity (16, 17).

### Galactogogues

There are not enough randomized controlled trials to suggest the use of either herbal agents or drugs (such as domperidone) (20).

### Indications for nutritional support for healthy breastfed term babies (expressed breast milk, formula):

Supplements should not be given without a medical order. Infant-related indications include asymptomatic hypo-

glycemia that does not improve despite frequent breastfeeding, symptomatic hypoglycemia (if the blood glucose is less than 25 mg / dL at first 4 hours, or less than 35mg / dL after 4 hours, intravenous glucose should be given while breastfeeding continues) and signs and symptoms indicating inadequate milk intake. The symptoms of inadequate intake are: the presence of clinical and laboratory signs of severe dehydration (e.g. 10% weight loss, hypernatremia, lethargy) that is not improved despite proper breastfeeding counseling, 8-10% weight loss on the fifth day or later, and the absence of milk (delayed lactogenesis), incapability to pass the first meconium or still passing meconium on the fifth day, and the inability of the baby to suck effectively despite the presence of milk (17, 21).

Despite proper breastfeeding counseling, support may be required for infants with low breast milk intake significant jaundice (hyperbilirubinemia in 2-5 days, with significant weight loss, inadequate stool and urine output, with urate crystals in the diaper) (21). If breast milk jaundice in a well-fed / growing baby is suspected, tests should be performed for differential diagnosis, breastmilk should not be ceased for diagnostic-therapeutic purposes. Special formulas may be required in babies with metabolic diseases (17, 21).

Risk factors for delayed lactogenesis (72-120 hours) related to the mother are, primary glandular insufficiency (failure of breast growth in pregnancy, absence of milk), placental retention, previous breast surgery that results in poor milk production, and disruption or interruption of breastfeeding due to the mother's illnesses or treatments/medications contraindicated in breastfeeding (17).

Additionally, supplemental feedings may be required if the mother and baby are separated and expressed milk cannot be supplied. The presence of severe pain that cannot be tolerated during breastfeeding that is unresponsive to any intervention, may require supplemental feeding (21).

#### **Methods to support nutrition/supplemental feeding:**

The best method to support nutrition is not determined; each method has its advantages and disadvantages, including cost, availability, ease of use and cleaning, intervening breastfeeding are important factors. The use of feeding devices should be chosen according to the baby's needs and mother's compliance: cup, spoon, dropper, special supplemental nursing systems, finger feeding or bottle). The mother's preference is also important. Cup feeding can be preferred because of ease of cleaning, no

adverse effect on breastfeeding, and safety for both term and preterm babies (15, 17, 22).

Because of different tongue, jaw, and palate maneuvers, and rapid and easy flow of milk, baby bottles affect breastfeeding negatively and carries the risk of nipple confusion. Therefore, its use should be avoided (17, 22).

#### **The amount of nutritional support:**

The increase in the baby's stomach volume over time, postnatal age, and weight affects the given volume. The amount of colostrum varies between 2-10 mL in the first 24 hours, 5-15 mL in 24-48 hours, 15-30 mL in 48-72 hours, and 30-60 mL in 72-96 hours (15, 22).

#### **Strategies to reduce the need for nutritional support:**

Efforts and strategies for breastfeeding will reduce the need for support. For this purpose, the following strategies can be followed (15, 17, 22):

1. All health care workers at maternity services should be competent to support breastfeeding.
2. Both mothers and healthcare providers should be aware of the disadvantages of unnecessary formula support and its negative effects on breastfeeding.
3. It is well-known that the direct skin-to-skin contact with the mother just after birth has a positive effect on breastfeeding. If breastfeeding is delayed, the risk of formula feeding increases which will result in a decreased breast milk supply.
4. The mother and baby should be kept in the same room 24 hours a day after delivery. Thus, milk expression increases due to the "on demand" breastfeeding.
5. In cases where the mother and baby are separated, mothers should be supported to express milk regularly to ensure the continuity.

#### **Expressing and the storage of breast milk:**

1. Preparation: Hands should be washed with soap and water before expressing milk. If the hands are clean and there is no visible dirt, alcohol-based disinfectants can be used (23).
2. Expressing milk by hand or by pump: the optimal method will vary depending on the time after birth, aim, and the individual characteristics of the mother / baby couple. It is reported that simple and cheap methods such as expressing milk manually, breast massage and applying heated towels to the breast before expressing milk, could be as effective as electrical pumps, but there is still a need for studies with high-level evidence to show which method is superior (22, 23).

**Table 3. The storage of breast milk (17, 23)**

	<b>ABM clinical protocols</b>	<b>Ministry of Health</b>
Room temperature (16-29°C)	4 hours (6-8 hours in clean environment)	3 hours
Refrigerator shelf (+4°C)	4 days (5-8 day in clean environment)	3 days
Deep freeze (<-18°C) acceptable)	6 months (12 months also acceptable)	3 months

ABM: The Academy of Breastfeeding Medicine

As a result, there is no superiority between expressing milk by hand or pumps, as long as it is done appropriately (to comply with hygiene requirements, to use the pump according to the manufacturer's recommendations). There is no need for disposal of the expressed foremilk.

3. Selection of the storage case: It is reported that the percentage of fat in the mother's milk decreases and the amount of protein and carbohydrates increase with the use of glass or polyethylene, polypropylene, polycarbonate, or polyethersulfone bottles or bags. No difference was found between glass and polypropylene in terms of adhesion of lipids to the surface. Caution should be taken against the risk of being contaminated by damaged plastic bags. Cases containing bisphenol should not be used. Plastic cases used to collect urine in hospitals should not be used. Only cases suitable for food storage can be used. Storage cases should be dried after washing with water and soap or washing in a dishwasher. They do not need to be sterilized. Chemical disinfectants should not be used (15, 17, 23).

4. Storage of expressed milk: The recommendations of the Ministry of Health and Academy of Breastfeeding Medicine (ABM) Clinical Protocol are shown in Table 3 (17, 23).

The lipid composition and lipase activity were shown to be stable for 96 hours in the refrigerator (24). Lactoferrin levels remained stable for 4-5 days (25). It has been reported that immunologic factors such as IgA, cytokines, and growth factor levels do not decrease in the refrigerator at 48 hours (26).

It has been reported that frozen expressed breast milk can be stored (-4 to -20°C) for at least 3 months without bacterial contamination (27).

It has been shown that fat, protein, and calories of breast milk did not decrease after 90 days of storage (28). There are studies with low-level evidence suggesting that the vitamin E levels do not change, whereas vitamin C levels decrease when breastmilk is frozen for 1-5 months (29). Bioactive substance levels reduce in varying proportions. Lactoferrin levels are significantly reduced when frozen at -20°C for three months, whereas IgA and various cytokines and growth factors in colostrum were reported to be unchanged (25, 26). Other macronutrients, osmolality, and immunoreactive proteins have been shown to be unchanged (30). Frozen milk should be stored in the back part of the freezer.

5. The smell of stored milk: There is a special odor due to the oxidation of fatty acids, which originate from the degradation of triglycerides (31, 32). It is not harmful to the baby.
6. It should be kept in mind that the expressed breast milk poured into the bag will be expanded when it is cooled. The name of the baby and date should be written on the storage cases. The milk should be stored in 15-60 mL portions (23).
7. Freshly expressed milk must not be mixed with pre-stored cold or frozen milk (23).
8. Use of stored breast milk: The cups where the milk is poured and given to the baby should be clean. It is sufficient to wash the cups in the dishwasher or with water and soap and dry with paper towels. It does not need to be sterilized for a healthy baby (23).
9. Fresh milk should be preferred to frozen milk (23).

10. The best way to dissolve frozen milk is to put it on the refrigerator shelf overnight. The other methods are to keep it under running lukewarm water after taking from the refrigerator, or to place it in a container with warm water (Bain-marie), but less lipid loss occurs when thawed in the refrigerator. When there is excess mother's milk which is heated using the Bain-marie method, the remaining milk should not be put back into the refrigerator (17, 23).

Defrosting in microwave oven is not recommended because it destroys the anti-infective properties of breast milk (23).

When frozen milk is heated and reaches room temperature, the ability to prevent bacterial growth is reduced. It should not be left at room temperature for more than a few hours and should not be frozen again. Thawed breast milk can be preserved in the refrigerator for 24 hours (23).

11. Heating the milk: Expressed and stored breastmilk

should be heated - up to 40°C - until it reaches body temperature. Heating the milk above 40°C degrees is not recommended because it destroys the immunologically active factors (23).

12. The use of thawed milk: Once frozen and thawed, breast milk's ability to inhibit bacterial growth is reduced, especially after standing at room temperature for 24 hours. For this reason, milk dissolved for 24 hours should not be kept longer than two hours at room temperature. It is not suggested to re-freeze thawed milk because the amount of bacteria in milk is related to how and for how long the milk has been dissolved and the amount of bacteria in the expressing phase (23).
13. The remaining milk should not be given later due to the risk of contamination (23).
14. Breast milk contains non-pathogenic bacteria. If the mother has experienced pain due to bacterial or fungal mastitis, the expressed milk is not removed; however, it should be discarded if it is malodorous or purulent (23).

### **Recommendations for breastfeeding mothers at discharge from the hospital**

#### **The 'Going Home' Protocol**

For the success and continuity of breastfeeding, the following principles and practices are recommended for the breastfeeding mother prior to sending a mother home: (15, 33)

1. The effectiveness of breastfeeding should be evaluated within eight hours before the discharge (position, latch-on the breast, milk flow, baby's weight and weight loss percentage, feces and urine output, presence of jaundice), the problems of the mother should be considered (nipple pain, expressing milk by hand, anxiety about insufficiency of breast milk, intention to give supplemental feeding.)
2. Risk factors belonging to the mother and baby which may cause feeding problems should have been evaluated.
3. The medical, psychosocial and social reasons underlying 'exclusive' breastfeeding for the first six months should have been explained very well.
4. Non-commercial educational materials related to breastfeeding are useful; however, distribution of 'discharge packs' containing formula, pacifier, and other advertising material should be prevented.
5. It is useful to inform breastfeeding mothers about pos-

sible problems, but be careful not to overload mothers with information. Simple, clear and written information about the following topics should be provided:

- a. Prevention and management of milk accumulation in the breast (engorged breast)
  - b. Indicators of adequate milk production
  - c. Adequate milk intake criteria
  - d. Mother's drug, smoking, and alcohol use
  - e. Follow up schedule
  - f. Newborn jaundice
  - g. Sleep pattern and safe sleeping position
  - h. Individual breastfeeding plan
  - i. Use of pacifiers (at least 3-4 weeks, should not be given until breastfeeding becomes regular)
  - j. Interpretation of infant cues and feeding "on cue"
6. All mothers should be taught about breast massage and breastmilk hand-expression techniques during their stay.
  7. Healthcare personnel and their contact information in case of breastfeeding problems should be provided.
  8. Those who are discharged early in the postnatal period (<48 hours) should be invited for follow-up within 24-48 hours (<72 hours, within 3-5 days).
  9. If the mother is ready to be discharged, but the baby is not ready, the mother should continue to stay in the hospital with the baby until the breastfeeding problems are solved.
  10. If the mother has to work, she should be informed about expressing, storing and transporting breast milk to home.
  11. If the mother is discharged earlier than the baby, she should accompany the baby as long as possible to breastfeed her baby.

### **Medical contraindications to breastfeeding or feeding expressed breast milk to Infants**

In the presence of a limited number of health problems of the mother or baby, breast milk may not be given temporarily or permanently. The recommendations of the American Academy of Pediatrics about this topic are listed below (7):

#### **a. Factors related to the baby**

- a. Babies who should not take breast milk or milk based formulas other than special formulas (in case of some congenital metabolic diseases):
  - i. Galactosemia- should be fed with lactose-free formula
  - ii. Maple syrup urine disease (MSUD) – should be fed with special formulas that do not contain leucine,



isoleucine, and valine

- iii. Phenylketonuria - should be fed with special formulas that do not contain phenyl alanine (some breastfeeding may be possible with careful monitoring)
- b. Although breastfeeding is the most appropriate form of nutrition, some babies may need other nutritional supplements in addition to breastmilk for a temporary period of time. These are:
  - i. Very-low-birth-weight infants whose birth weight is <1500 g
  - ii. Preterm babies with gestational age <32 weeks
  - iii. Neonates who are at risk for hypoglycemia due to metabolic adaptation problems or increased glucose requirement, or who cannot regulate blood sugar despite optimal breastfeeding or feeding on breast milk (e.g. preterm, SGA, intrapartum hypoxic / ischemic stress, sick infants, infant of a diabetic mother)

#### **b. Factors related to the mother**

- a. Conditions in which breastfeeding is stopped permanently:
  - i. Human immune deficiency virus infection
- b. Conditions in which breastfeeding is stopped temporarily:
  - i. Maternal sickness that is severe enough to prevent her to take care of her baby (e.g. sepsis)
  - ii. Herpes simplex virus-type 1 (HSV-1) - breastfeeding is interrupted from the affected breast until all active lesions have passed to prevent oral contact with the lesions.
  - iii. While H1N1 infection is active, breastfeeding could be interrupted but expressed milk might be given.
  - iv. Maternal drugs\*:
    - Psychotherapeutic drugs, anti-epileptics, opioids and their combinations (may cause tendency to sleep and respiratory depression, and should not be used if there is a safer option)
    - Radioactive iodine-131 (should not be preferred because there are safer options, but if used, the baby can be breastfed again two months after the administration of the radioactive material)
    - Topical iodine or iodophores (e.g. povidone iodine) (should not be used because it may lead to thyroid suppression or electrolyte abnormalities in the breastfed baby, especially when used in open wounds or mucous membranes)
    - Cytotoxic chemotherapy (during treatment breastfeeding should be discontinued)
- c. In cases where breastfeeding may continue with care and the mother should be informed about the risks.

- i. Breast abscess – Start lactation from the unaffected breast; after the initiation of treatment the affected breast can be used.
- ii. Hepatitis B- After postnatal prophylaxis (Hepatitis B vaccine and Hepatitis B Ig)
- iii. Hepatitis C
- iv. Mastitis: if lactation is very painful, its progression should be prevented by expressing milk.
- v. Tuberculosis: lactation is stopped till contamination risk has passed (at least two weeks of anti-tuberculosis treatment), but expressed breast milk can be given during this period.
- vi. Substance abuse: nicotine, alcohol, ecstasy, amphetamines, cocaine and other stimulants have harmful effects on the breastfeeding baby; alcohol, opioids, benzodiazepines and cannabis sedate both the baby and the mother.

The compatibility of the medication used during breastfeeding, can be checked through textbooks or web sides (34).

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