

MINISTRY OF HEALTH OF UKRAINE
BOGOMOLETS NATIONAL MEDICAL UNIVERSITY
METHODOLOGICAL GUIDELINES

for practical classes for students

<i>Academic discipline</i>	Propaedeutics of paediatrics, including nursing practice and basic medical skills in a paediatric ward
<i>Field of study</i>	22 "Health care", second (Master's) educational and qualification level
<i>Speciality</i>	222 "Medicine"
<i>Department</i>	Paediatrics No. 2
<i>Content module 3</i>	Types of infant feeding. Nutrition of children over one year of age. Features of metabolism in children.
<i>Topic:</i>	Breastfeeding (natural feeding) of infants. Quantitative and qualitative composition of breast milk. Methods of calculating the daily volume of food and the feeding regimen. Complementary feeding and dietary correction. Daily requirement of the child for food ingredients and energy.
<i>Year of study</i>	3

Approved at the meeting of the Department of Paediatrics N of " " August 2026,

Reviewed and approved: Central Methodological Commission for Paediatric Disciplines of " " August 2026

1. Aim: to build professional competencies in order to achieve the programme learning outcomes on the breastfeeding of infants, namely:

acquisition by the student of knowledge of:

1. The main principles of successful breastfeeding of children proposed by WHO and UNICEF.
2. The quantitative and qualitative composition of human colostrum, mature milk and transitional milk.
3. The features of human milk that give it its biological value compared with cow's milk and the milk of other animal species, and their effect on the child's development.
4. Calculation of the volume of the daily diet of a child in the first year of life using different methods.
5. The infant's requirement for the main nutrients and calories.
6. The rules and timing for introducing corrective supplements and complementary foods into the child's diet.
7. The features of the diet of a breastfeeding mother.
8. Hypogalactia. Prediction of its development, prevention and treatment.
9. An approximate scheme for drawing up the diet of a breastfed child in the first year of life.

2. Competencies:

1. Drawing up a daily diet for a healthy breastfed child in the first year of life.
2. Evaluating history data that indicate the quality of the child's nutrition, identifying errors in the child's prescribed diet and correcting them according to the existing rules.
3. Drawing up a diet for a breastfeeding mother.
4. Identifying and evaluating clinical signs that indicate that the child is underfed, and the ability to eliminate them.
5. Predicting the development of hypogalactia, and carrying out prevention and treatment of this condition.

Equipment: tables of the content of the main food ingredients in baby food products, a textbook, a computer.

3. Plan and organisational structure of the class

Name of stage	Description of stage	Levels of mastery*	Time (min)
Preparatory stage	Organisational arrangements Setting the learning objectives, motivating the students	*	10
Main stage	Test control on the topic of the class, checking and announcing the results. – theoretical questioning; – demonstration of practical skills, explanation of the most important points in drawing up a daily diet for a healthy breastfed child in the first year of life; – work by the students to acquire the skills of drawing up a daily diet for a healthy breastfed child in the first year of life; – acquisition by the students of the ability to evaluate the results of the prescribed diet and, where necessary, to adjust it. Solving case problems on the topic of the class	** *, **, *** ****	20 55 20
Concluding stage	Analysis and evaluation of the results of the students' work. Announcement of the topic of the next class, guidance chart for independent work with the literature.		10
	Total 2.5 academic hours		115

* familiarisation, ** reproductive, *** reconstructive, **** creative levels of mastery.

4. Content of the teaching material

4.1. List of the main terms, parameters and characteristics that the student must master when preparing for the class:

Term	Definition
1. Natural, or breast, feeding	Natural feeding means feeding a child with breast milk. Moreover, the child must receive it in an amount of not less than 75% of the daily volume of food.
2. Mammogenesis	The phase of development of the mammary gland in the first 2–3 months of pregnancy
3. Lactogenesis	Milk secretion – holomerocrine secretion by the cells of the acinus, accompanied by destruction of epithelial cells
4. Galactopoiesis	Accumulation of the milk secreted by the mammary gland
5. Corrective supplements	Food products that correct the child's diet with respect to trace elements and vitamins (meat, fruit purée, egg yolk, etc.)
6. Complementary food	Solid food that gradually replaces breast milk, with the aim of further meeting the child's nutritional needs

4.2 Content of the topic:

Breast milk is the best and most natural source of nutrition for infants, providing the optimal balance of nutrients for their healthy development. Health experts recommend exclusive breastfeeding for the first six months of life, after which they advise gradually introducing complementary foods while continuing breastfeeding at least until the first year of life or longer.

These recommendations are based on extensive evidence of the benefits of breastfeeding for both mother and child. They are actively supported by such authoritative organisations as the American Academy of Pediatrics, the World Health Organization (WHO) and UNICEF.

The unique composition of breast milk

Breast milk is a living biological substance that far exceeds in complexity a simple set of nutritional components. It contains not only macronutrients and micronutrients, but also unique living cells, growth factors and immunomodulating substances.

Many of these components retain their biological activity even after passing through the infant's digestive tract. For example, immunoglobulins, in particular secretory immunoglobulin A (IgA), lysozyme, lactoferrin, mucins and human milk oligosaccharides play a key role *in protecting the infant against intestinal and respiratory infections*.

Hormones such as cortisol, somatomedin C, insulin-like growth factors, insulin and thyroid hormones, together with growth factors (in particular epidermal growth factor), gastrointestinal mediators (neurotensin, motilin) and amino acids that stimulate the growth of enterocytes (taurine and glutamine), ensure *the development and functioning of the child's gastrointestinal tract*.

Lipids play an extremely important role in *the neurological development of infants*. In particular, sphingomyelin supports myelination processes in the central nervous system, which is critical for the formation of nerve pathways.

Long-chain polyunsaturated fatty acids are an integral part of neuronal membranes; they contribute to cerebral metabolism, cell differentiation, synaptic plasticity, neuroprotection and the reduction of inflammatory processes. In addition, they play a significant role in the maturation of the visual system, ensuring optimal *development and functioning of the eyes in infants*.

The adaptive nature of breast milk

The composition of breast milk changes in real time, adapting to the child's needs. This unique process takes into account the period after birth, the frequency of feeds, the time of day, the baby's state of health and the mother's diet. Breast milk adapts to every stage of the child's development, supporting the child's immunity and ensuring optimal development.

The period immediately after birth is extremely vulnerable for the newborn child. With an immature immune system, the baby encounters a large number of pathogenic microorganisms for the first time, relying solely on antibodies received through the placenta from the mother. At this critical time, colostrum plays a special role – the milk that is produced in the first days after birth. It contains a unique concentration of bioactive immunological and anti-inflammatory components, significantly exceeding their content in transitional and mature milk. Thanks to this, colostrum provides the child with effective passive immunisation from the very first days of life.

As the transition from colostrum to mature milk takes place, a decrease in the content of proteins and amino acids is observed, while the level of fats gradually increases. In addition, breast milk shows pronounced circadian fluctuations in the content of such substances as tryptophan, fats, triacylglycerols, cholesterol, iron, melatonin, cortisol and cortisone. These changes help to regulate vital functions of the newborn's body, ensuring harmonious development.

Modern infant formulas try to come as close as possible to the composition of breast milk, but individual isolated nutrients cannot provide the same level of benefit. Breast milk remains unique thanks to its dynamic adaptation to the individual needs of the child, which makes it an irreplaceable source of nutrition in the first months of life.

Benefits of breastfeeding for infants

Breastfeeding provides numerous benefits for the child's health, many of which persist even after feeding has ended. It is associated with a reduced risk of developing a number of acute and chronic diseases, in particular: *acute respiratory infections of the upper and lower airways, acute and recurrent otitis media, and gastroenteritis*.

Breastfeeding reduces the likelihood of *sudden infant death syndrome* by 36% and provides effective prevention of *neonatal sepsis and urinary tract infections*. In addition, breastfeeding has an analgesic effect: skin-to-skin contact and the natural properties of

breast milk help to reduce pain and stress during medical procedures, which has been confirmed by numerous studies.

Breastfeeding also reduces the risk of *obesity, asthma, atopic dermatitis, type 1 diabetes mellitus, leukaemia, cardiovascular diseases and intestinal diseases such as Crohn's disease, ulcerative colitis and coeliac disease.*

In addition, breastfeeding is associated with fewer serious infections requiring hospitalisation in the first year of life. It has been shown that the risk of hospitalisation due to infectious diseases decreases by 4% for each additional month of breastfeeding.

Benefits of breastfeeding for the mother

Early initiation of breastfeeding after childbirth stimulates the production of oxytocin, which promotes uterine contraction. This helps to return the uterus to its normal size more quickly and significantly *reduces the risk of excessive postpartum blood loss.*

Exclusive breastfeeding also delays the return of ovulation after childbirth thanks to a hormonal mechanism that is well studied in the scientific literature. The duration of *lactational amenorrhoea* depends on the frequency and intensity of feeds.

In addition, breastfeeding may have a positive effect on the mother's psychological state. Studies indicate a possible link between the duration of breastfeeding and *a reduced risk of developing postpartum depression.*

Prolonged breastfeeding is also associated with a reduced risk of developing certain diseases in the future, including:

- *breast, ovarian and endometrial cancer;*
- *hypertension and cardiovascular diseases;*
- *type 2 diabetes mellitus.*

Meta-analyses confirm that women who have breastfed have a better *cardiometabolic profile* and *a reduced risk of developing cardiovascular diseases.*

Economic and social benefits of breastfeeding

Breastfeeding helps to avoid the cost of infant formula and feeding accessories, in particular bottles and teats. On a global scale, the cost of infant formula amounts on average to 6.1% of family income, which can be a significant financial burden, especially for low-income families.

Thanks to the positive effect of breastfeeding on the health of mother and child, the family can also substantially reduce spending on medical care.

Improving global breastfeeding rates is capable of preventing a large number of child and maternal deaths.

Successful breastfeeding

The main signs of successful breastfeeding include:

- painless and comfortable attachment of the baby to the breast;
- active swallowing of milk by the child;
- steady and sufficient weight gain by the baby;
- absence of complications in the mother during the period of lactation;
- satisfaction with the feeding process for both mother and child.

The success of breastfeeding depends to a large extent on the mother's level of awareness and on the support she receives from medical staff at all stages: during pregnancy, in the maternity hospital and after discharge.

Preparation for breastfeeding

Even before the baby is born, the pregnant woman and her family should be informed about the importance and benefits of breastfeeding. It is necessary to discuss previous experience of lactation and to identify possible risk factors that may affect this process in the future. On admission to the maternity hospital, the pregnant woman's knowledge of breastfeeding should be assessed, and she should be helped to form realistic expectations about caring for a newborn.

Initiation of breastfeeding in the maternity hospital

In the first days after childbirth, mothers may feel emotionally and physically exhausted. It is therefore important that medical staff support them and provide the necessary information about the baby's condition and the effectiveness of breastfeeding.

The main strategies for supporting breastfeeding in hospitals and maternity hospitals are set out in the "Ten Steps to Successful Breastfeeding" programme developed by the World Health Organization. Medical institutions that follow these recommendations may be awarded "Baby-Friendly Hospital" status.

Giving birth in such institutions has a positive effect on the success of breastfeeding, which is confirmed by higher rates of breastfeeding initiation, a longer duration of exclusive breastfeeding, and an increase in the overall breastfeeding period, which may last even up to 12 months after childbirth.

Ten Steps to Successful Breastfeeding

Hospital policy:

- 1a. Comply with the International Code of Marketing of Breast-milk Substitutes and the relevant World Health Assembly resolutions.
- 1b. Have a written breastfeeding policy that is routinely communicated to staff and parents.
2. Ensure an adequate level of knowledge, competence and skills among medical staff for the effective support of breastfeeding.

Key clinical practices:

3. Inform pregnant women and their families about the importance of breastfeeding and the principles of how it is organised.
4. Facilitate immediate and uninterrupted skin-to-skin contact and ensure the first attachment to the breast as early as possible after birth.
5. Provide help to mothers in initiating and maintaining breastfeeding, and in resolving possible difficulties.
6. Avoid giving breastfed infants any food or fluid other than breast milk unless this is medically indicated.
7. Provide the opportunity for mothers and infants to remain together in the same room 24 hours a day.
8. Encourage breastfeeding on demand and teach mothers to recognise the child's needs.
9. Provide counselling on the risks of using artificial teats or dummies for breastfed infants.
10. Support the establishment of breastfeeding help and support groups after discharge from the maternity hospital.

Postnatal care

After discharge from the maternity hospital, it is important to ensure that parents have access to regular monitoring of the child's condition and to breastfeeding support.

Correct technique for attachment to the breast

Correct attachment to the breast is the foundation of successful breastfeeding. The main signs of correct attachment:

- *Absence of pain and discomfort in the mother* during feeding indicates correct technique.
- *Position of the baby's body*: the head, body and pelvis should be in one line. The child's head should not be held fixed, as this may cause discomfort.
- *Position of the child in relation to the mother*: the infant's abdomen should be pressed against the mother's body, and the arms should be positioned alongside the body or wrapped around the mother.
- *The baby's mouth is wide open*, with the lower lip turned outwards.
- *Asymmetric latch*: the child's mouth takes in the greater part of the lower areola of the breast. The nipple is positioned high in the child's oral cavity, reaching the junction between the hard and soft palate. The baby's tongue touches the base of the nipple rather than its tip, ensuring a free flow of milk and preventing injury to the nipple.
- *Free breathing through the nose*, with the chin almost touching the breast.

In addition to the signs listed above, it is also important to pay attention to the sound of the child's swallowing. At the beginning of a feed, rapid sucking is often observed, which

stimulates the milk ejection reflex. After the milk begins to flow actively, the cycle changes: approximately three to five sucking movements are accompanied by a swallow.

The choice of feeding position is an individual matter for each mother. The main thing is that the position should be comfortable for both the woman and the child, ensure correct attachment to the breast and allow effective feeding.

“Cradle hold” – the classic position, in which the mother supports the baby with the arm on the side of the breast she is feeding from. The infant lies tummy to tummy with the mother, with its ear, shoulder and hip in one line. The mother’s arm supports the child’s back, and her palm supports the buttocks.

“Cross-cradle hold” – similar to the previous one, but support is provided with the opposite arm. With the other hand the mother adjusts the position of the baby’s head, helping correct attachment to the breast. For convenience, a pillow can be used to reduce the strain on the arms.

“Biological nurturing position” (laid-back, relaxed feeding position) – the mother half-lies or leans back, and the child is positioned on her, tummy to tummy.

“Side-lying position” – the mother and baby lie on their sides facing each other, with the nipple level with the child’s mouth. The back of the infant’s head rests in the crook of the mother’s elbow, and with her arm the mother supports the baby, ensuring close tummy-to-tummy contact.

“Underarm position” (also called the “clutch” or “football hold”) – suitable for mothers after a caesarean section or when feeding twins. The baby is at the mother’s side, with its legs pointing backwards and its head supported by the mother’s hand. For convenience, a pillow can be placed under the arm holding the child.

Frequency and duration of feeds

In accordance with the Ten Steps to Successful Breastfeeding, the child should be put to the breast according to the child’s need, that is, each time the child shows signs of hunger. In the first 8 weeks the child should be put to the breast at least 8 times over 24 hours; there are no restrictions on the maximum frequency and duration of feeds. It is precisely this approach that underlies the concept of responsive feeding. Newborns usually wake up to feed 8–12 times over 24 hours, and some babies may ask for the breast every hour.

Signs of the need to feed may be the infant turning its head in search of the breast, opening and closing its mouth, licking its lips, or sucking its fingers or hands. It is worth remembering that crying is a late sign of hunger, so it is important to put the infant to the breast at the first stirrings or signals.

Cluster feeding – several short feeds one after another – is considered normal behaviour in newborns. In such a case the attachment technique should be assessed and the child’s behaviour at the breast and after the feed should be observed.

In order to understand the child's feeding needs, parents should also recognise the signs that the child is full. These include a satisfied and calm appearance in the baby, the absence of signs of hunger, and relaxation of the arms and facial muscles.

Assessing the amount of breast milk

Most mothers are able to produce enough milk to fully meet their infant's needs. The production and maintenance of the breast milk supply depends on the frequency and effectiveness with which it is removed, since supply matches demand.

However, there are situations that can reduce milk production.

Factors on the mother's side:

- Surgical interventions (breast reduction, sometimes breast augmentation).
- Nipple pain, which makes feeding difficult.
- Taking medicines that reduce lactation (oral contraceptives with a high oestrogen content, pseudoephedrine, nicotine, diuretics, antihistamines, high doses of steroids).
- Hormonal problems: stress, obesity, pre-eclampsia, hypertension, diabetes, hypothyroidism.
- Impaired development of glandular tissue due to congenital pathologies.

Factors on the child's side:

- Prematurity.
- Ankyloglossia (tongue-tie).
- Delayed neuromotor development.
- Impaired sucking or swallowing.
- Malformations of the lip or palate.

Other factors:

- Delayed initiation of breastfeeding.
- Separate accommodation of mother and child.
- Incorrect technique of attachment to the breast.
- Infrequent attachment to the breast or the use of formula.

Where risk factors are present, support and timely consultation can help the successful establishment of lactation.

Signs that the child is not consuming enough breast milk

In newborns it is important to monitor the infant's weight loss after birth and the dynamics of subsequent weight gain. In general, physiological weight loss amounts to no more than 10% of the birth weight, with subsequent recovery of that weight by day 14 of life. In addition to significant weight loss and insufficient recovery of weight, signs of insufficient milk intake in the first 3–4 days of life are also:

- Fewer urinations than the number of days of age (for example, fewer than one on the first day, two on the second, and so on)
- Fewer than one bowel movement per day
- The infant does not settle after a feed
- Dryness of the mucous membranes
- Reduced skin turgor.

Subsequently, reliable signs that the child is not consuming enough breast milk are:

- Insufficient weight gain in the child (less than 500 g per month);
- Urination fewer than 6 times a day.

If signs are found that the child is not consuming enough milk, it is necessary to review the frequency and technique of attaching the child to the breast, to assess risk factors for reduced milk production in the mother, and so on. Timely consultation makes it possible to establish breastfeeding and to prevent an unjustified switch to artificial feeding.

Contraindications to breastfeeding

Absolute contraindications to breastfeeding and to feeding with expressed milk are:

- Classic galactosaemia in the infant
- The mother has HIV infection, under the conditions that:
 - The mother is not receiving antiretroviral therapy.
 - Antiretroviral therapy is present, but there is no sustained viral suppression.
- Infection of the mother with human T-cell lymphotropic virus type I or II
- The mother uses illicit drugs (for example, phencyclidine, cocaine).
- Suspected or confirmed Ebola virus disease in the mother.

Temporary contraindications to breastfeeding and to feeding with expressed milk:

- Untreated brucellosis in the mother.

- The mother is taking medicines that are incompatible with breastfeeding.
- The mother has an active herpes simplex virus infection with lesions on the breast.
- Infection of the mother with monkeypox virus.

In these cases breastfeeding may be resumed after consultation with a clinician following recovery or after the course of medicines has ended. During this period it is extremely important to maintain lactation.

Temporary contraindications to breastfeeding with the possibility of feeding expressed milk:

- Untreated active tuberculosis.
- Active chickenpox that developed in the mother in the 5 days before delivery and within 2 days after it.

In these cases temporary separation of mother and infant may be recommended in order to prevent airborne or contact transmission of the infection. After consultation with a doctor, mothers may resume breastfeeding once the risk of infection has passed.

Difficulties with breastfeeding

Pain in the nipples and breasts is the most common problem that mothers face during breastfeeding. The main cause is often *incorrect attachment to the breast* or *ineffective sucking*, but there are also other possible factors:

- Vasoconstriction of the nipples (Raynaud's disease).
- Blocked ducts of the mammary glands.
- Infections of the nipples and breasts, including lactational mastitis and abscess.
- Dermatitis or psoriasis of the nipples.

In the first days of lactation some women may notice bloody discharge from the nipples. Such phenomena occur more often during a first pregnancy and are usually associated with increased vascularisation of the alveoli and ducts during the period when milk production starts. The colour of the milk may change from pink to red or brown, but these changes usually disappear within a few days.

Sometimes mothers face overproduction of milk (hypergalactia), which creates difficulties for both the woman and the child. Infants may not cope with the strong flow of milk and begin to cough, choke or become irritable. Paradoxical consequences may also be observed: from increased weight gain to insufficient weight because the child is unable to obtain the more calorie-rich hindmilk. Usually such overproduction normalises during the first weeks of lactation.

Dysphoric milk ejection reflex is another rare but characteristic condition, in which the woman experiences negative emotions (anxiety, sadness, nervousness) before milk ejection. This condition, which lasts several minutes, is associated with hormonal

fluctuations and tends to improve as the child grows older. To minimise discomfort, distracting activities such as a light snack or watching television during the feed may be useful.

Sometimes the shape of the nipples, in particular flat or inverted nipples, may create certain difficulties during breastfeeding. In such cases the mother may use simple techniques that help to make it easier for the baby to attach to the breast. Before a feed she can try gentle massage of the nipples or briefly use a breast pump to give the nipple a more pronounced shape. Some women are helped by the temporary use of special nipple shields, but these should be used carefully and under the supervision of a breastfeeding counsellor. To ensure an effective asymmetric latch, it is important to pay attention to the child's position: the angle at which the infant approaches the breast can be increased, which will support correct attachment and comfortable feeding.

Features of the mother's nutrition during lactation

A healthy woman who is breastfeeding produces approximately 750–800 ml of milk per day. During lactation she needs additional energy and nutrients. However, scientific studies show that even where the mother's nutrition is inadequate, her breast milk almost always contains a sufficient quantity of nutrients for the full growth and development of the infant.

Women who follow a balanced diet can meet the increased need for nutrients simply by increasing their food intake. Optimal nutrition includes: dairy products, meat and fish, vegetables rich in vitamins and minerals, fruit and cereals. At the same time, a moderate diet for gradual weight loss does no harm either to the mother or to the child.

The quantity and quality of breast milk are practically independent of the mother's diet. The total fat content changes only slightly, but the composition of the fatty acids depends on the type of fats consumed. In particular, since omega-3 long-chain polyunsaturated fatty acids play an important role in the development of the child's brain, it is recommended to consume 2–3 portions of a variety of seafood per week (choosing varieties with a low mercury content).

Breast milk contains a sufficient quantity of vitamins and minerals, apart from vitamins D and K. That is precisely why additional vitamin D intake is recommended for all infants for the prevention of rickets, and vitamin K must be given to all newborns to prevent bleeding.

At present there is no evidence that avoiding certain products (for example, milk, eggs, peanuts) during lactation prevents the development of allergies in children. Therefore special diets without medical indications are not recommended.

Thus, breastfeeding mothers do not need to follow any special diet. Among the products that should be limited, fish with a high mercury content should be mentioned (bigeye tuna, king mackerel, swordfish, shark). As regards drinks, moderate caffeine consumption is recommended (2–3 cups per day). Alcohol consumption must be strictly limited, since there is no safe dose of alcohol.

Ending breastfeeding

The time to end breastfeeding is a personal decision of the mother, which she takes taking her social environment into account. Weaning from the breast may vary in speed: it may be either rapid or gradual. Sudden, rapid weaning is generally not recommended; it often occurs because of unforeseen separation of mother and child or because of serious illness in the mother. In such a case the woman may experience a flu-like state with fever, and the sharp fall in prolactin levels may cause depressive symptoms.

Gradual ending of breastfeeding after 6 months is a more physiological approach, which allows both the child and the mother to adapt to the changes. Strategies for gradual weaning include shortening the duration of each feed, increasing the intervals between feeds, and gradually giving up daytime feeds and later night-time feeds as well.

Supplementary feeding

Supplementary feeding with infant formula should be introduced for breastfed infants only where there are medical indications, such as clinical signs of insufficient milk intake. If the mother's breast milk production is sufficient, preference should be given to expressed breast milk rather than formula.

It is important to avoid the unjustified addition of infant formula in the maternity ward, since this substantially increases the risk of early cessation of breastfeeding. Where additional feeding is necessary, the first step should be an expert assessment of breastfeeding with the aim of identifying and eliminating potential causes of insufficient intake.

Possible causes include:

- feeds that are not frequent enough,
- ineffective sucking with limited milk transfer (for example, in the case of painful attachment),
- insufficient milk production in the mother.

If the introduction of formula is medically necessary, in most cases it is a temporary measure. At the same time, attention should be paid to optimising breastfeeding technique, removing possible barriers to effective feeding, and stimulating lactation by means of more frequent attachment to the breast and expressing in order to empty the breasts fully.

The Academy of Breastfeeding Medicine recommends the following volumes of milk intake for healthy full-term infants depending on age:

- *First 24 hours* – 2–10 ml per feed
- *24–48 hours* – 5–15 ml per feed
- *48–72 hours* – 15–30 ml per feed
- *72–96 hours* – 30–60 ml per feed

Where supplementary feeding of the child is necessary, several methods of supplementation can be chosen from: a supplemental nursing system at the breast, supplementation with a cup, spoon or pipette, finger feeding, supplementation with a syringe, or bottle feeding.

Each of the methods has its advantages and disadvantages. For example, a supplemental nursing system at the breast helps to maintain lactation, but such systems are relatively expensive and using them requires additional training. The most common method is bottle feeding, but it should be noted that during sucking from a bottle the movements of the child's tongue and jaw differ substantially from those involved in breastfeeding. In addition, the faster flow of milk may lead to excessive (and not always necessary) intake of milk volumes.

As lactation and the effectiveness of the infant's sucking increase, the amount of supplementary feeding can be gradually reduced. A correct approach to supplementary feeding will help to avoid difficulties with lactation and will support a return to full breastfeeding.

Formulas for calculating the daily volume of food for children.

The volumetric method is used for children aged from 2 weeks to 12 months:

2–6 weeks – $\frac{1}{5}$ of the child's body weight,

6 weeks – 4 months – $\frac{1}{6}$ of the child's body weight,

4–6 months – $\frac{1}{7}$ of the child's body weight,

6–12 months – $\frac{1}{8}$ – $\frac{1}{9}$ of the child's body weight.

Caloric (energy) method: per 1 kg of body weight the child should receive:

0–3 months – 120 kcal per 24 hours,

4–6 months – 115 kcal per 24 hours,

7–12 months – 110 kcal per 24 hours.

Since it is known that 1 litre of breast milk contains 700 kcal, it is easy to calculate the daily requirement.

Complementary food is food products that are introduced in addition to breast milk (or to infant formula in the case of artificial feeding) for a child in the first year of life.

Before introducing complementary food, it is necessary to be sure that the child is ready for it.

ESPGHAN experts recommend individual indications and timing for the introduction of complementary food at 17–26 weeks, with the aim of forming food tolerance

Signs that the child is ready for the introduction of complementary food:

- holds its head up;
- sits almost without support (in a feeding chair);
- opens its mouth when a spoon with food is brought to it;
- turns away from the spoon with food when it is not hungry;
- closes its mouth with the spoon in its mouth, holds the food in its mouth and then swallows it, rather than pushing it out or spitting it out.

Rules for introducing complementary food

- 1) In each individual case, the introduction of complementary food should be a process of introducing food products recommended in accordance with the child's age, with a gradual change over time in their consistency, taste, smell and appearance, while breastfeeding continues at the same time.
- 2) It is necessary to be sure that the child is ready for the introduction of complementary food.
- 3) Complementary food should be given when the child is active and hungry, preferably during breakfast or lunch together with other family members.
- 4) During feeding the child should be in an upright position, in a comfortable posture in the arms or on the lap of the mother, or in a special children's chair.
- 5) Complementary food must be given from a spoon.
- 6) Complementary food should be started by placing a small amount of food on the tip of a teaspoon. The spoon should be held so that the child can see it. Then touch the spoon to the child's lips so that part of the product remains on the lips. And only when the child opens its mouth should the spoon with the food be placed in the middle of the tongue – then the child will swallow it easily.
- 7) Each complementary food product is introduced starting from 1 teaspoon and increasing gradually, over 5–7 days, up to a full portion, divided between 2 feeds. The child itself will show that it has had enough by turning its head away, pushing the spoon away, or not opening its mouth.
- 8) Every time after the child has received complementary food, it is advisable to put it to the breast. This will help to maintain lactation, and the child will feel satisfied.
- 9) If the child refuses complementary food, it should not be fed by force, as the child may refuse all other products altogether. Another product can be offered (of a different taste and/or consistency), or the same one but on another day. During feeding it is necessary for the mother to talk to the child.
- 10) Each subsequent new complementary food product should consist of one ingredient and be given to the child for at least 5 days; only after this can mixed complementary

food made from these products be given. This will make it possible to determine the cause of a food allergy should one occur.

- 11) To make it easier for the child to get used to new products, it is recommended to add breast milk to complementary food products.
- 12) Complementary food should be freshly prepared, have a smooth homogeneous consistency, from cream-like to sour-cream-like (according to age), and be cooled to body temperature (36–37 °C).
- 13) For the prevention of iron-deficiency anaemia, from 6 months complementary food products that contain iron (meat, egg yolk, fish) must be introduced.
- 14) No kinds of tea or coffee are recommended for children under 2 years of age, as these drinks interfere with the process of iron absorption.
- 15) Whole undiluted cow's milk should not be given to children under 12 months (a factor in the development of iron-deficiency anaemia).
- 16) Whole milk and dairy products may be given to a child from 12 months.
- 17) During the period of introducing complementary food, salt and spices should not be added to complementary food products.
- 18) If signs of poor tolerance of a complementary food product appear (disturbance of the function of the digestive system, allergic reactions or others), the introduction of that complementary food product should be stopped and another one introduced.

Corrective supplements

- **At 6.5 months** – meat: rabbit, chicken, turkey, veal, lean pork;
- **At 7 months** – vegetable oil;
- **At 7 months** – boiled egg yolk;
- **At 8 months** – bread;
- **At 9 months** – rusks, biscuits;
- **At 8–10 months** – minced fish: lean fish is recommended at first (pollock, cod, perch, pike-perch, hake). Red fish is introduced into the child's menu after the first year of life (pink salmon, chum salmon, trout);
- **At 6.5–7.5 months** – soft cheese (curd cheese). The dish must be prepared immediately before the feed; commercially produced versions must not be given to children under one year of age. Give 3–4 times a week.
- **Fruit purée** – made from green varieties of apples; peach and apricot are recommended next, then plum. The amount of purée is gradually increased from 1 teaspoon to 100 g per day by the end of the first year of life. After 9 months the

purée is replaced by small pieces of boiled vegetables and of ripe, baked or boiled fruit.

Methods of introducing complementary food.

Three types of complementary feeding are distinguished:

- traditional complementary feeding
- complementary feeding by the BLW method
- combined complementary feeding

Traditional complementary feeding

Traditional complementary feeding consists in the parents or carers feeding the child from a spoon with puréed food or liquid porridges. This is a gradual transition from liquid food to thicker food.

Main characteristics:

- Complementary feeding begins with puréed products (vegetable and fruit purées, liquid porridges).
- Products are introduced gradually.
- Feeding is carried out from a spoon by parents or carers.
- The texture of the food is gradually increased: from purée to coarser mashing, and later to pieces.
- Breastfeeding or formula remains the main source of nutrition, and solid food acts as a supplement.

Advantages:

- It is easy to control the amount of food the child receives.
- There is a lower likelihood of choking, since all the food is well mashed.
- It makes it possible to introduce individual products and observe the reaction to each of them (this is especially important for children with allergies).

Disadvantages:

- The child does not always learn to control its appetite and to understand its body's signals, since the process is controlled by an adult.
- Motor self-care skills and chewing are not developed at an early stage.

Complementary feeding by the BLW (Baby-Led Weaning) method

The BLW method means that the child is offered pieces of solid food straight away, which it can pick up with its hands and try to eat itself, managing the feeding process independently. This allows the child to experience the texture and taste of different products from the very beginning.

Main characteristics:

- The child is offered solid food in the form of pieces that are easy to pick up with the hands. For example, pieces of cooked vegetables, fruit, or soft meat.
- It is important that the food is prepared in such a way as to avoid the risk of choking (correct cutting, shape and softness of the pieces).
- The child itself decides how much food to eat, and also learns to hold and chew food.
- Breastfeeding or formula remains the main source of nutrition, and solid food acts as a supplement.

Advantages:

- It develops motor skills and the ability to pick up food with the hands.
- The child learns to control its appetite and to eat until it is full.
- It stimulates the development of chewing skills and earlier acquaintance with different food textures.
- The child takes an active part in the process of eating, which may increase interest in food and reduce the risk of eating problems in the future.

Disadvantages:

- There is a greater risk of choking, so it is important always to watch the child while it is eating.
- The eating process may be messier and require more time and patience.
- Parents may feel more anxious, because it is harder to control the amount of food consumed (but is that really necessary? :)

Combined approach

Many parents choose a combined approach, blending elements of traditional complementary feeding and BLW. For example, one can start with puréed food and then gradually add pieces of solid food, allowing the child to take part in the eating process independently. This makes it possible to obtain the advantages of both methods and to avoid their disadvantages.

NB! Types of texture can be combined (purée / pieces), but different textures must not be mixed in one spoonful (liquid separately and thick separately).

How to choose an approach?

The choice of type of complementary feeding depends on several factors:

- The child's character: some children are more active and strive for independence, in which case the BLW method may be ideal. Others may be more cautious and need more help, so traditional complementary feeding suits them better.
- The parents' time and readiness: BLW requires more attention and patience from parents, especially at the beginning, so it is important to be ready for the process to take longer and sometimes be messier.
- Family traditions: sometimes the choice of complementary feeding method depends on cultural and family customs.

Since every child is an individual, different methods can be tried and the one chosen that suits your child and family best.

Number of meals when introducing complementary food

First of all, the main guide is the child and its interest in food. It is important to increase the number of meals gradually and not to replace breastfeeding or artificial feeding with complementary food (up to one year of age this is the base, the foundation).

How to compose the child's plate and which products to start with

The plate should be balanced. A very simple method to use is the Healthy Eating Plate. The "Healthy Eating Plate" is what one should ideally aim for.

Rules for composing the plate:

Offer the child vegetables and fruit every day.

The main drink is water (not sweet drinks, or various teas or children's juices).

Ratio of proteins, fats and carbohydrates: 10% : 35% : 55%;

Vegetables and fruit should make up the main part of the meal – ½ of the plate.

Preference should be given to whole-grain products – ¼ of the plate: whole and unrefined grains: barley, wheat, oats, buckwheat, rice, and also products made from them. For example, pasta made from durum wheat is healthier than white bread, white rice and other refined grains.

Protein – ¼ of the plate. Fish, seafood, chicken, beans and nuts are healthy and varied sources of protein.

Add healthy vegetable oils in moderate amounts.

Visually divide the plate into four parts. Fill the plate so that each part is occupied by a particular food group: protein dishes, grains, fruit and vegetables.

The best choice for starting complementary feeding is products that contain iron and zinc, such as meat and grains (buckwheat, rice, oat and maize porridges). Introducing one product at a time with an interval of 2–3 (3–5) days while observing for symptoms of intolerance/allergy indicates a successful introduction. In order to develop a taste for a particular product, children need to try it between 2 and 15 times.

Allergens in the child's diet

There are 14 allergens that are recognised as the most common causes of food allergies in Europe:

1. milk
2. eggs
3. peanuts
4. soya beans
5. fish
6. crustaceans (crabs, lobsters, prawns)
7. nuts (every type of nut is an allergen)
8. molluscs (oysters, scallops, snails, squid)
9. cereal products containing gluten (wheat, rye, barley, oats)
10. sesame
11. celery and products made from it
12. mustard
13. sulphites and products containing them (sulphites are preservatives used to prevent oxidation and to preserve products. They may be present in such products as: dried fruit, sauces and seasonings, tinned vegetables)
14. lupin (flour, plant-based milk)

Introducing allergens into the diet:

Any product may provoke an allergic reaction. Different products have different proteins, and every protein molecule may be a trigger allergen. Particular immune mechanisms are responsible for this.

A reaction in the form of a mild rash is not always a “classic” manifestation of an allergic reaction. It may be a flare-up of atopic dermatitis or perioral dermatitis, or a contact reaction;

In any case this is sensitisation. Sensitisation, in simple terms, is the body's first acquaintance with the molecules of the allergen. And that acquaintance may not always go well.

With each subsequent offering, the body will become acquainted with and get used to the allergen molecules – it will develop tolerance to it. From the moment an allergen is offered, it **must be in the child's diet on a permanent basis**, in order to develop (permanent) protective titres. Of course this does not mean every day, but at least once every 1–2 weeks. **Allergens should be offered ONLY in the first half of the day.**

It is recommended to offer allergens to children before 11 months of age. This is the so-called window of tolerance. It gives – not a large one, but it does give – a guarantee that *the risk of allergic reactions will be lower*. In other words, **the later you offer allergens to a child, the higher the risk of allergic reactions to them in the future.**

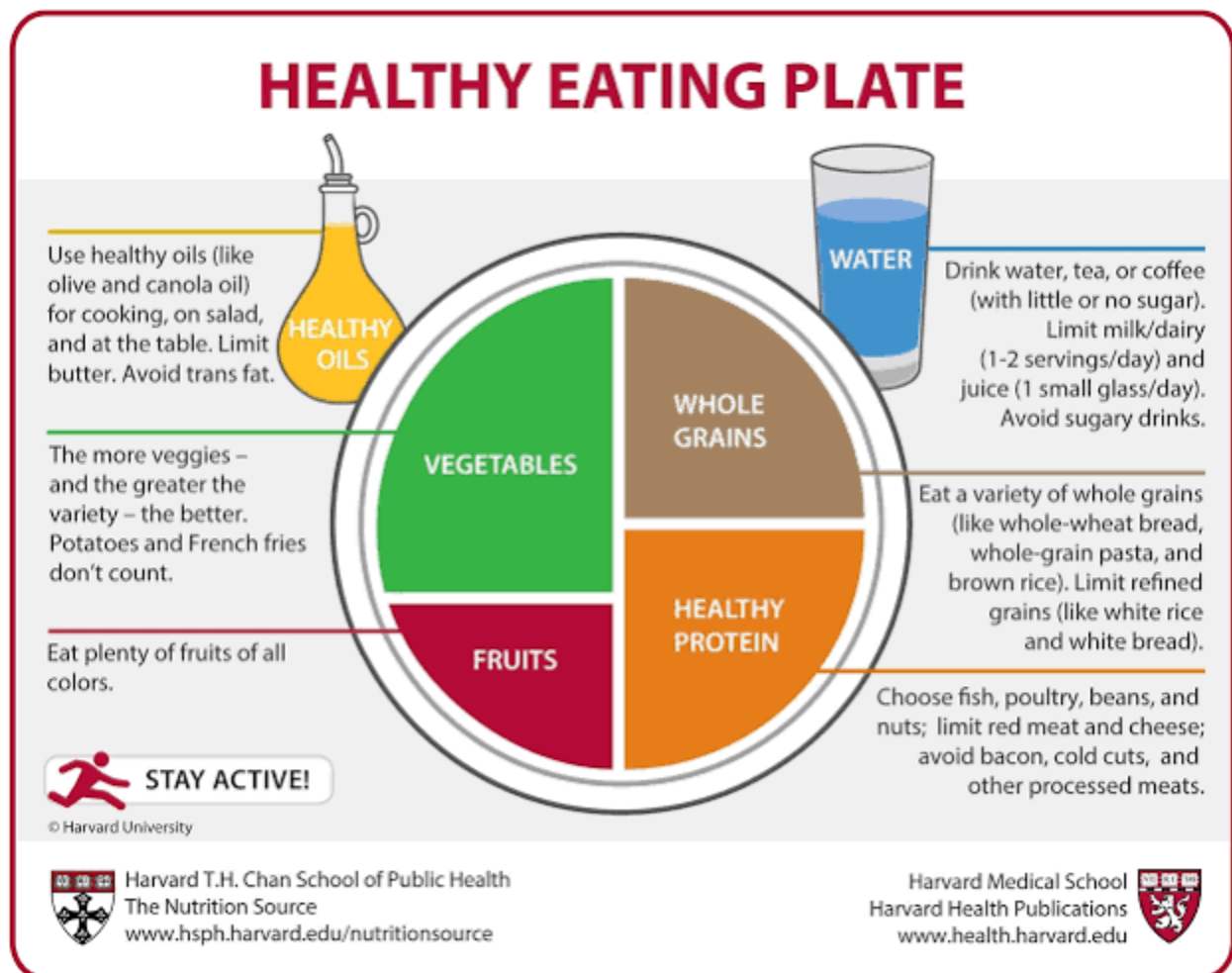


Illustration from the original document: the "Healthy Eating Plate" (Harvard School of Public Health – The Nutrition Source; Harvard Medical School – Harvard Health Publications), shown in Ukrainian. The plate is divided into four sections: vegetables and fruit (about half the plate), whole grains, and protein foods, with healthy oils and water shown alongside, plus a reminder to stay physically active.

Products to be avoided

- **Salt:** it is recommended to limit children's salt intake up to 1 year of age. After one year the daily amount of salt for children up to 3 years is approximately 1–2 grams, and for children over 3 years – up to 3–5 grams. This helps to prevent kidney problems and to preserve health in the future. Iodised salt is recommended to be introduced for children from 2 years of age. This group also includes products with a high salt content, for example brined cheeses (feta, brynza) or matured cheeses (parmesan, pecorino).
- **Sugar:** for children under 2 years of age it is recommended to limit the consumption of added sugar, and better still to avoid it altogether. After 2 years sugar may be introduced in small amounts, but care should be taken to keep its consumption low. Sugar may lead to dental caries and weight problems.
- **Honey:** honey must not be given before 1 year of age, as it may cause botulism in infants.
- **Raw milk:** raw cow's milk is not recommended before 1 year of age, as it may lead to allergy or digestive disorders and to the development of anaemia. Pasteurised milk may be used, but exclusively as an ingredient in dishes (for example, in pancakes) and not as a drink on its own, since as a drink milk may create a risk of developing iron-deficiency anaemia by interfering with iron absorption.
- **Mould-ripened cheeses:** these may cause listeriosis, which leads to serious damage to the nervous system.
- **Processed and fried products:** exclude sausages, frankfurters, fried dishes and fast food from the diet, since they contain harmful fats, additives and a large amount of salt.
- **Popcorn** should not be offered to children under 2 years of age.
- **Wild mushrooms:** these must not be given to children under 12 years of age, since there is a high risk of poisoning and, in the worst cases, death. For our part, we would recommend not eating them after the age of 12 either, since the risks remain high for both children and adults.

Questions for the student's independent preparation for the practical class

1. What is unique about the composition of breast milk, and how does it change during the different periods of lactation?
2. What are the main benefits of breastfeeding for the child, the mother and society?
3. What does the concept of successful breastfeeding include?
4. What are the rules and the technique for correctly attaching a child to the breast?
5. What should the frequency and duration of feeds be for a breastfed infant?

6. What factors may increase the risk that a child is not consuming enough breast milk?
7. What are the main signs that a child is receiving an insufficient amount of breast milk?
8. In which cases is breastfeeding or feeding with expressed milk contraindicated?
9. What difficulties may arise with breastfeeding, and how can they be overcome?
10. What are the features of the nutrition of a breastfeeding mother?
11. Which methods of ending breastfeeding are considered the most physiological?
12. In which cases may supplementary feeding of the baby with infant formula be needed, and how should it be organised correctly?
13. Give a definition of the concept of complementary food.
14. Which products belong to complementary foods?
15. Which products belong to corrective supplements?
16. Name the rules for introducing corrective supplements and complementary foods.
17. Using which formulas can the approximate daily volume of food for a child in the first year of life be calculated?

Test questions

1. The main signs of successful breastfeeding include:
 - A. Steady and sufficient weight gain by the baby
 - B. A duration of night-time sleep in the infant of not less than 8 hours
 - C. A need to feed in the child no more often than every 3 hours
 - D. Breastfeeding during the first 6 months of life with gradual cessation
 - E. An established hourly regimen of feeds and sleep in the child
2. The Ten Steps to Successful Breastfeeding include:
 - A. Ensuring the first attachment of the child to the breast within the first 24 hours after delivery, after the mother has fully rested
 - B. Facilitating immediate skin-to-skin contact
 - C. Supplementary feeding of the newborn with special formulas before discharge from the maternity hospital
 - D. Using dummies and teats to soothe the infant

- E. Putting the child to the breast every 3–4 hours.
3. The correct technique for attaching a child to the breast includes:
- A. Mandatory holding of the child's head by the mother
 - B. The child's mouth must take in the base of the nipple
 - C. The child's mouth symmetrically takes in the upper and lower parts of the areola
 - D. Free breathing through the nose, mouth wide open
 - E. All of the above is correct
4. Signs that a child is not consuming enough breast milk in the first 3–4 days of life:
- A. Fewer than 1 urination per day of the child's life
 - B. Fewer than 5 bowel movements per day
 - C. The infant shows hunger signals more than 8 times in 24 hours
 - D. Absence of a night-time break from feeding of at least 6 hours
 - E. Weight loss by the child after birth
5. Breastfeeding, including feeding with expressed breast milk, is contraindicated in the case of:
- A. Confirmed COVID-19 in the mother
 - B. Dental procedures in the mother using local anaesthesia
 - C. Classic galactosaemia in the child
 - D. Absence of milk in the mother when expressing
 - E. The presence of neonatal acne on the child's skin

Correct answers: 1 – A, 2 – B, 3 – D, 4 – A, 5 – C

Case problem 1.

A mother came to a family doctor with a 3.5-month-old child who is being breastfed. The baby is put to the breast on demand, but the mother is worried that he may not be getting enough milk. She is concerned by the frequent appearance of signs of hunger – every 30–40 minutes. After a feed she tries to express milk, but obtains only a small amount – about two tablespoons. In addition, the mother carried out test weighing before and after a feed, recording a difference of 25 g. The child's weight gain history: **at birth** – 3,340 g, **at 1 month** – 3,920 g, **at 2 months** – 4,750 g, **at 3 months** – 5,200 g.

Over 24 hours the mother notes 4 full nappies; the child has a bowel movement every day. Objective examination shows that the baby is healthy and that his psychomotor development corresponds to the age norm. What recommendations should be given to the mother in this situation?

Answer:

Since the increase in body weight over the third month is less than 500 g, this may indicate insufficient intake of breast milk. However, prescribing supplementary feeding with infant formula in this situation is premature.

Recommendations for the mother:

Check the attachment technique – it is important to make sure that the child is latching on to the breast correctly. Does the mother feel discomfort during the feed?

Ensure more frequent attachment – put the child to the breast as often as possible and offer both breasts at one feed, or even offer the breasts alternately.

Assess the mother's nutrition – pay attention to her appetite, adequate fluid intake and the overall balance of her diet.

Follow-up weight monitoring – weighing after a week. If the gain amounts to 120–130 g, these recommendations should continue to be followed.

It is important to note that test weighing of the child before and after a feed is not an objective method of assessing the amount of milk received and can only increase the mother's anxiety. In the same way, the volume of milk that can be expressed after a feed is not a reliable indicator of lactation.

Case problem 2.

A mother of a 29-day-old infant came to a family doctor. For the first three days after birth, in the maternity hospital, the child was kept separately from the mother and received formula. After discharge the mother tried to breastfeed, but because of incorrect technique cracks and pain in the nipples developed. Despite the discomfort, she continued breastfeeding, but at the same time gave the child supplementary formula feeds.

At present the baby is predominantly breastfed, but the mother sometimes gives formula at night, fearing that there is not enough milk, especially when the child shows restlessness during a feed. She also asks whether the benefit of breast milk is retained if the child receives additional feeding with formula, since she has read that supplementary feeding may reduce the benefits of breastfeeding.

What recommendations should be given to the mother?

Answer:

In this situation there are risk factors for insufficient milk production:

- Separate accommodation of mother and child in the maternity hospital

- Supplementary feeding with formula in the first days of life
- Incorrect attachment to the breast and pain in the nipples
- Use of a bottle and teat

Recommendations:

1. Assess the increase in body weight – if the child has gained more than 500 g in the first month, this corresponds to the norm and there is no need for supplementary feeding with formula.
2. Give up the bottle and teat – they may affect the sucking technique and reduce the effectiveness of breastfeeding.
3. Optimise feeding:
 - Put the child to the breast more often
 - Offer both breasts at one feed
 - After a feed, additionally express milk to stimulate lactation
4. Monitor the child's weight – a gain of 120–130 g per week is considered normal.
5. If weight gain is insufficient and supplementary feeding is necessary, use a supplemental nursing system at the breast instead of a bottle.

Breast milk remains valuable regardless of whether the child receives formula. However, in order to maintain lactation and make maximum use of the benefits of breastfeeding, the proportion of formula should be gradually reduced and milk production should be stimulated by natural means.

Recommended literature.

1. World Health Organization. Breastfeeding. Available at:
<https://www.who.int/topics/breastfeeding/en/>
2. Ukrainian Academy of Breastfeeding Medicine, Position Paper No. 4: Organisation of breastfeeding.

https://drive.google.com/file/d/1CI0t_XU5Q_zMBg1WkvIO11grihVWi83N/view

3. Ann Kellams; UpToDate; Initiation of breastfeeding; Mar 14, 2024

<https://www.uptodate.com/contents/initiation-of-breastfeeding>

4. Ukrainian Academy of Breastfeeding Medicine, Position Paper No. 3: Nutrition of women during lactation. The effect of nutrition on the composition of breast milk and on the condition of mother and child.

<https://drive.google.com/file/d/1WGRhkTsumriJXdfGWGtEpK6QyhRLEffA/view>