Experimental and Applied Medical Science, 2, 3: 203 - 209, 2021. DOI 10.46871/eams.2021.25

Review Article

The Miraculous Nutrient: Human Breast Milk

Aliye Bulut[1*], Elif Bayrakçı[1]

[1]*Gaziantep Islam Science and Technology University, Faculty of Health Sciences, Department of Midwifery, Gaziantep, Turkey.*

Abstract

Breastfeeding gives every child the best possible start in life. It is very beneficial for both children and mothers in terms of health, nutrition and emotionality. Moreover, it forms part of a sustainable nutrition system. Human breast milk is the miraculous nutrition source that contains all the nutrients needed for the normal growth, development and protection of newborns from diseases. In addition to the benefits of human breast milk for the baby, it is known that it has many benefits in terms of attachment, mental health, behavioural effects and the mother in the long and short term.

***Key Words*:** *Breastfeeding, Human breast milk, Infant nutrition.*

1. Introduction

Human breast milk is the most beneficial source of nutrients in terms of nutritional, hygienic and economic aspects compared to other foods, and it has a very special biological and emotional effect (1). It contains all the nutrients needed for the normal growth, development and protection of newborns from diseases (2). In the Convention on the Rights of the Child adopted by the United Nations General Assembly (UNGA) in 1989, it was emphasized that "all segments of the society should be informed about breastfeeding, supported and provided with educational opportunities in this field" and "breastfeeding is the human right" (3). This review was made to address the content of human breast milk and to examine the benefits of human breast milk in many other aspects for the mother, child and the society. Especially by drawing attention to the importance of human breast milk in the first six months, it will enable mothers to be much more conscious in the postpartum period. Therefore, the mother, baby and the society will benefit from the benefits of human breast milk at the highest level, thus contributing to the realization of qualified breastfeeding.

2. Material and Methods

The data in this review were searched through the Cochrane Library, EMBASE (OVID), Pub Med, Web of Science, Google Scholar and WHO Global databases. The keywords "Human Breast Milk", "Breastfeeding", "Breast Milk" and "Lactation" were used during the investigation.

3. Human Breast Milk in the History

When the historical development of the practices related to infant nutrition was

***Corresponding author**: Aliye Bulut, Tel: +90 505 817 3113, E-mail:aliyedemirok@yahoo.com, ORCID ID: 0000-0002-4326-0000.

examined, it has been seen that the most important nutrient in infant nutrition until today has been human breast milk. It was emphasized that in the Ebers Papyrus (Ancient Egypt 1550 BC), one of the historical works, the only nutrient to be used in infant feeding is human breast milk and that the baby should receive human breast milk until the age of three (4,5). Babylonians (Mesopotamia), who attached great importance to breastfeeding, depicted their chief god Ishtar, when she was breastfeeding her baby. In Yakut Turks, who believed in the sanctity of human breast milk, we can come across the beliefs that Ayzıt, the mother goddess, revived her baby by giving human breast milk. Similar beliefs have increased with the emergence of the religion of Islam, and according to Islam, there is a connection between the mother's nutrition and the infant's breastfeeding (4).

In the books written in Europe during the Renaissance, it was stated that human breast milk was the most ideal nutrient for babies. However, the inclusion of women in working life with the industrial revolution in Europe in the 20th century led to a decrease in the interest in breastfeeding and the spread of untrue practices such as social change movements and the transformation of bottle-feeding into the symbol of modern motherhood (5). After the 1970s, the focus of research on human breast milk and the increasing number of studies until today have emphasized that human breast milk is a unique nutrient, and it is very important for infant nutrition. While the rate of breastfeeding was 24.9% in the 1970s, today this rate has increased by 3-4 times. This increase is undoubtedly due to the fact that experts in various fields of science have internalized the importance of the benefits of breastfeeding (4). While the use of human breast milk is increasing rapidly in the world, the same is true for our country. According to the Turkey Demographic Health Survey (TDHS-2018) conducted in our country, the breastfeeding rate and duration were given in Figure 1 (6).

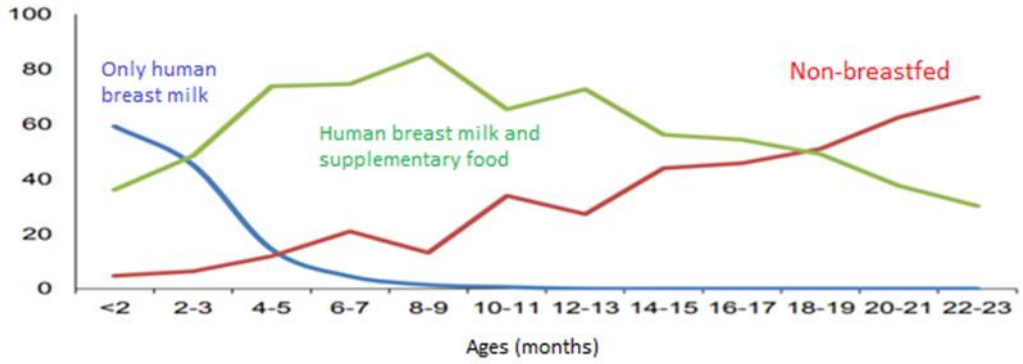

Figure 1. The breastfeeding practices and the percentage distributions of children under 2 years old (TDHS-2018).

4. Human Breast Milk in terms of Nutritional Value

The most important feature of human breast milk content is that it varies according to the age and condition of the baby. For example, mothers who gave birth prematurely secrete milk suitable for the weight of their babies, gestational week

and kidney solute loads (7). The difference between the breast milk of premature and term mothers disappears after the first month. In the period from birth to the first month, the content of human breast milk (in terms of nutritional elements) varies in accordance with the baby's digestive system (7,8). The content of human breast milk is complex, it contains multiple supplements, and they vary widely. The density of some nutrients can also differ between women, during breastfeeding and throughout the day (7). Changing the content of human breast milk allows it to adapt to meet the baby's ongoing need. In addition, changing diet potentially stimulates sensory development, and it allows for better acceptance of new nutrients and flavours (8-10).

4.1. The Content of Human Breast Milk

Human Breast milk can be examined in two parts as nutritional content and bioactive content (11).

4.1.1. Nutritional Content

4.1.1.1. Macronutrients

Approximate amounts of protein, fat, lactose and energy content of mature term human breast milk were given in Table 1 (12).

Table 1: Content of Mature Term Breast Milk by Essential Nutrients.

Macronutrients	
Protein	0.9-1.2 g/dl
Fat	3.2-3.6 g/dl
Lactose	6.7-7.8 g/dl
Energy (kcal)	65-70 kcal/dl

The Composition of Human Breast Milk Protein

The high ratio of whey: casein (60:40), whey proteins both facilitates digestion and the substances that prevent infection in the whey section that protects the baby against the diseases. Although human breast milk carries a lower level of protein than cow's milk, it creates the ideal protein structure by providing adequate tryptophan level and appropriate amino acid storage in the infants due to its richness of protein content in whey protein and alpha-lactalbumin (12).

The Oils of Human Breast Milk

The baby's main energy source is comprised of oils. Both the high ratio of unsaturated fatty acids and milk lipase make digestion easy and fast. Large amounts of long-chain fatty acids in human breast milk are beneficial for both brain and eye development (10).

The Carbohydrates of Human Breast Milk

Lactose, which is the main carbohydrate source of human breast milk, facilitates calcium absorption, provides the necessary energy for brain development and prevents the growth of harmful microorganisms in the intestine (9).

Major changes occur in the content of human breast milk in the first month after birth. While there may be differences between mothers, it also varies between the baby's gestational week, postnatal age and the beginning of breastfeeding (9-11).

Term Milk/Premature Human Breast Milk

In the first weeks, human breast milk, which is provided by a mother who gave a premature birth, has a higher level of protein, fat and sodium than term human breast milk. The difference disappears in the following weeks (12).

Colostrum

It is the milk that is secreted in the first

five days after birth and whose amount, appearance and content are different. It is yellowish in color and secreted in small amounts. Colostrum facilitates the outflow of meconium with its laxative and protein degrading effect and prevents meconium ileus. It is also described as the baby's first vaccine (13).

- It has the antibodies and white blood cells that protect from diseases and allergies, Secretory IgA, lactoferrin, macrophages. It is rich in factors that prevent infection such as T and B lymphocytes.
- It contains epidermal growth factors that provide maturation of the intestine and prevent the development of allergies and intolerances.
- Vitamins A, D and B12, sodium and zinc content are higher than mature human breast milk.
- It protects against jaundice by allowing bilirubin to be expelled from the intestine.
- The low lactose content indicates that its main function is immunological and trophic, not nutritional.
- Colostrum reflects the general structure and properties of maternal blood. This physiological similarity is an advantage for the newborn who is accustomed to intrauterine life. Gradually, there are differences in the content of milk and it reaches the grade of mature milk within 15 days (11).

Transitional Human Breast Milk

It is the milk secreted between five days and two weeks after the birth. Its amount is higher than colostrum. While the protein content decreases, the lactose, fat, and calorie contents increase.

Mature Milk It is the milk secreted two weeks after the birth. Human breast milk gains a fully mature milk feature in postnatal 4^{th}-6^{th} weeks.

Foremilk-Hindmilk

High carbohydrate milk is secreted at the beginning of breastfeeding, and high-fat milk is secreted at the end. It is difficult to predict when this change occurs in the breastfeeding process; however, what is important is that the baby should discharge the breast and leave the breast spontaneously in order to provide all the needs of the infant and to regulate the milk secretion cycle. In this case, the infants can take the oil-rich hindmilk (11,12).

4.1.1.2. Micronutrients

The micronutrient content of breast milk varies according to the mother's diet and storage (such as vitamins A, B1, B2, B6, B12, D and iodine). Since the mother's nutrition is not always very good, multi-vitamin supplements are recommended to the mother during breastfeeding. Since the amount of vitamin K in milk is very low regardless of maternal nutrition, 1 mg of vitamin K should be given IM to each newborn. However, vitamin D is also low in breast milk, so it is recommended to take early supplements. The iron content of breast milk is low, and iron deficiency anemia is rarely seen in the first 6-8 months in babies who are fed with breast milk alone and whose umbilical cord is clamped late, since its absorption is very high (9).

4.1.1.3 Water Content and Taste The water content of human breast milk is high, and there is no need to give additional water as long as the baby is breastfed whenever he wants, even in the hottest weather. The taste of human breast milk differs according to what the mother eats. These changes in taste make it easier for the baby to adapt to the taste of the food eaten in the

baby's family and to switch to additional nutrients after the sixth month (14).

5. The Importance of Human Breast Milk in terms of Infant Health

The purpose of infant nutrition is to meet basic nutritional needs and to support growth and development. Human breast milk is the main food for the baby from birth to one year old, and its importance lasts until the age of two (15). The organizations such as the World Health Organization (WHO), the American Academy of Paediatrics (AAP), and the United Nations International Children's Fund (UNICEF) recommend starting breastfeeding within the first half hour after birth and providing only breast milk for the first six months. They also state that it would be good to continue breastfeeding from the first six months along with nutritional supplements until the age of two and above (16). According to the American Dietetic Society, breastfeeding during the first six months of life is the most suitable nutrition for babies, and it is very important for the protection of health. In addition, breastfeeding has important contributions to public health such as improving and maintaining newborn health, reducing morbidity, mortality and health care expenditures (15, 16).

The perfection of mother's milk, which is a unique natural food suitable for the offspring of every living creature, is due to the fact that it provides the growing organism with the nutrients that are needed with the changing content. While breast milk contributes to the healthy growth and development of babies, it also plays an important role in establishing and strengthening the bond between mother and baby (17). The studies have shown that bacterial meningitis, sepsis, diarrhoea, respiratory tract infection, severe gastrointestinal infection, middle ear infection, urinary tract infection in babies who are not breastfed, and that the incidence and severity of late-stage infections in preterm babies are higher (17-19). In addition, according to a study, it was reported that the prevalence of premature retinopathy was higher in premature babies who were fed with infant formula instead of human breast milk (18).

Furthermore, several studies have shown increased rates of sudden infant death syndrome in the first year of life, as well as diabetes mellitus in older children and adults who were formula-fed compared to those who were breastfed; childhood cancers such as leukaemia, Hodgkin's disease and lymphoma; an increase in the incidence of obesity, asthma and high cholesterol levels (20, 21). There is some evidence to suggest that the breastfed babies are not only healthy, but also tend to be smarter. Various studies on intelligence development in the infants have shown that infant formula feeding is associated with lower intelligence performance (22).

6. The Advantages of Breastfeeding for the Maternal Health

Feeding babies only with breast milk in the first six months of life, continuing breastfeeding with additional nutrients after the sixth month and continuing breastfeeding until the age of two provide numerous benefits for both the baby and the mother (23).

When skin-to-skin contact between mother and baby is facilitated by breastfeeding, the risk of late postpartum haemorrhage in the mother is considerably reduced. Oxytocin is a natural method of preventing postpartum haemorrhage following delivery (24). Women who have not

menstruated six months after birth, who do not regularly supplement with infant formula, who do not exceed four hours during the daytime breastfeeding period and six hours during the night breastfeeding period, have a less than 2% chance of conception (25). In addition, mothers who breastfeed often return to their pre-pregnancy weight faster than mothers who do not breastfeed. Breastfeeding has another long-term positive effect on women's health. Women who do not breastfeed have an increased risk of developing both breast and ovarian cancer later in life. From a psychological point of view, breastfeeding also promotes the feeling of motherhood; it is a natural sedative for the mother and strengthens the bond between mother and baby. Breastfeeding mothers are more self-confident, which also positively affects the milk yield (21).

7. Conclusion

Various policies are developed in the world and in our country regarding human breast milk, which is so valuable. Promoting human breast milk with the project initiated by the Ministry of Health and UNICEF as "Baby-Friendly Hospital" has provided a social motivation. In addition to all these benefits, the fact that a nutrient equivalent to human breast milk has not been produced until today reveals that human breast milk is indispensable and an excellent nutrition for the newborn.

It is recommended that pregnant women attend the antenatal education sessions. It is also suggested to draw attention to human breast milk and breastfeeding in these trainings, inform mothers about the content and benefits of human breast milk, and encourage them to breastfeed their babies.

8. Conflict of Interest

There is no conflict of interest between the authors.

9. Acknowledgement

No financial support was received from any institution for the research.

References

1. Labbok, MH. Effects of breastfeeding on the mother. Pediatric Clinics of North America. 2001;48(1):143-158.
2. Ballard O, Morrow,A.L. Human milk composition: nutrients and bioactive factors. Pediatric Clinics. 2013;60(1):49-74.
3. Birleşmiş Milletler Genel Kurulu. Birleşmiş Milletler Çocuk Haklarına Dair Sözleşme, 1989. Available at https://www.unicef.org/turkey/çocuk-haklarına-dair-sözleşme. Accessed May 18, 2021.
4. Tolunay O. Türk Tıp Tarihinde Emzirme. Mersin Üniversitesi Tıp Fakültesi Lokman Hekim Tıp Tarihi ve Folklorik Tıp Dergisi. 2014;4(3):6-10.
5. Sağlık M. Emziren Annelerin Süt Yetersizliği Algısını Yönetiminde Yapılandırılmış Eğitim ve İzlemin Etkinliği, Yüksek Lisans Tezi, 2019.
6. Hacettepe University Institute of Population Studies. 2018 Turkey Demographic and Health Survey. In.: Hacettepe University Institute of Population Studies, T.R. Presidency of Turkey Directorate of Strategy and Budget and TÜBİTAK, Ankara, Turkey; 2019.
7. Branger B. Description of 101 cases of nipple cracks and risk factors via case–control study in eight units of a perinatal network. Archives de Pédiatrie. 2020;27(1):45-50.
8. Altindag O, Joyce TJ, Reeder JA. Can Nonexperimental Methods Provide Unbiased Estimates of a Breastfeeding Intervention? A Within-Study Comparison of Peer Counseling in Oregon. Evaluation review. 2019;43(3-4);152-188.
9. Ballard O, Morrow AL. Human milk composition, nutrients and bioactive factors. Pediatr Clin N Am. 2013;60:49-74.
10. Lawrence RA, Lawrence RM. Biochemistry of human milk. In: Lawrence RA and Lawrence RM, (eds). A guide for medical profession. 8th edition. Saunders. 2016;91-146.
11. Furman L, Schanler RJ. Breastfeeding. In: Gleason CA, Juul S, (eds). Avery's diseases of the newborn. 10th edition. Philadelphia: PA, Elsevier. 2018;991-1008.
12. Kültürsay N, Bilgen H, Türkyılmaz C. Türk Neonatoloji Derneği - Sağlıklı Term Bebeğin

Beslenmesi Rehberi, 2014. Available at http://www.neonatology.org.tr/wp-content/uploads/2016/12/term_beslenme.pdf. Accessed May 18, 2021.
13. Pérez-Escamilla R. Breastfeeding in the 21st century: How we can make it work. Social Science & Medicine. 2020;244;112331.
14. American Academy of Pediatrics section on breastfeeding. Breastfeeding and the use of human milk. Pediatrics. 2012;129:e827–e41.
15. World Health Organization Exclusive Breastfeeding. Available at1. https://www.who.int/elena/titles/exclusive_breastfeeding/en/. Accessed February 2, 2021.
16. American Academy of Pediatrics Breastfeeding. Available at https://services.aap.org/en/patient-care/breastfeeding/. 2021; Accessed May 10, 2021.
17. Davie P, Chilcot J, Chang YS, et al. Effectiveness of social-psychological interventions at promoting breastfeeding initiation, duration and exclusivity: a systematic review and meta-analysis. Health psychology review. 2020;14(4):449-485.
18. Carome K, Rahman A, Parvez B. Exclusive human milk diet reduces incidence of severe intraventricular hemorrhage in extremely low birth weight infants. Journal of Perinatology. 2021;41(3):535-543.
19. Chen A, Rogan WJ. Breastfeeding and the risk of postneonatal death in the United States. Pediatrics, 2004; 113(5), e435-e439.
20. Owen, CG, Whincup PH, Odoki K, et al. Infant feding and blood cholesterol: a study in adolescent and a systematic review. Pediatrics. 2002;110(3):597-608.
21. Cowgill B. Back to the Breast: An Historical Overview of the Perceived Connections Between Sudden Infant Death Syndrome and Breastfeeding. Journal of Human Lactation. 2020;36(2):310-317.
22. Plunkett BA, Mele L, Casey BM, et al. Human Development (NICHD) Maternal-Fetal Medicine Units (MFMU) Network. Association of Breastfeeding and Child IQ Score at Age 5 Years. Obstetrics & Gynecology. 2021;137(4):561-570.
23. Çeber E, Akçiçek E.(Editör). Anne Sütü ve Sütannelik. Birinci Basım. İzmir: Egetan Basın Yayın. 2011;49-69.
24. Gün İ, Yılmaz M, Şahin H, et al. Kayseri Melikgazi Eğitim ve Araştırma Bölgesi'nde 0-36 aylık çocuklarda anne sütü alma durumu. Çocuk Sağlığı ve Hastalıkları Dergisi. 2009;52:176-182.
25. Köksal G, Özel HG. Bebek Beslenmesi. T.C. Sağlık Bakanlığı. Birinci Basım. Ankara: Klasmat Matbaacılık. 2008. Available at https://sbu.saglik.gov.tr/Ekutuphane/kitaplar/A%208.pdf. Accessed September 9, 2021.