Arquivos Médicos
DOS HOSPITAIS E DA FACULDADE DE CIÊNCIAS MÉDICAS DA SANTA CASA DE SÃO PAULO

REVIEW

Arq Med Hosp Fac Cienc Med Santa Casa São Paulo. 2022; 67:e001
https://doi.org/10.26432/1809-3019.2022.67.001

Maternal knowledge about the protective immunological role of breast milk for the newborn

Conhecimento materno sobre o papel imunológico protetor do leite materno para o recém-nascido

Eduarda Barbosa de Jesus [1], **Tainá Mosca** [2], **Wilma Carvalho Neves Forte** [2]

Abstract

Introduction*: Breast milk is rich in protective factors determining the reduction of morbidity and mortality of the newborn. The mothers' knowledge about the immunological elements of milk can influence the duration of breastfeeding.* ***Objectives:*** *To survey the information available, in scientific articles, on maternal knowledge about the immunological importance of breastfeeding for the newborn.* ***Method:*** *This was a study of a narrative review of the literature from the last twenty years, in Portuguese, English, and Spanish, which related breastfeeding with the baby's immune response and mothers' knowledge about the protective importance of breast milk.* ***Results:*** *Thirty-eight articles were found, 15 on mothers' knowledge regarding the immunological importance of breastfeeding and 23 related to the immunological components present in breast milk. The main knowledge cited in the articles is related to protection against diseases without specifying the reasons for such protection.* ***Conclusion:*** *There are more articles in the literature about the immunological components present in breast milk, than articles about mothers' knowledge about the immunological importance of breastfeeding for newborn.*

Keywords: *Breast feeding, Knowledge, Newborn, Immune system*

Resumo

Introdução: *O leite materno é rico em fatores de proteção determinantes para redução da morbimortalidade do recém-nascido. O conhecimento das mães sobre os elementos imunológicos presentes no leite pode influenciar na duração do tempo de amamentação.* ***Objetivos:*** *Levantar as informações disponíveis, em artigos científicos, relativas ao conhecimento materno sobre a importância imunológica do aleitamento materno para o recém-nascido.* ***Método:*** *Estudo de revisão narrativa da literatura dos últimos vinte anos, nos idiomas português, inglês e espanhol, que relacionam a amamentação com a resposta imunológica do bebê e conhecimento das mães sobre a importância protetora do leite materno.* ***Resultados:*** *Foram encontrados 38 artigos, sendo 15 sobre o conhecimento das mães em relação à importância imunológica do aleitamento materno e 23 relacionados aos componentes imunológicos presentes leite materno. Os principais conhecimentos citados nos artigos de forma geral são relativos à proteção contra doenças sem especificar os motivos de tal proteção.* ***Conclusão:*** *Há na literatura mais artigos sobre os componentes imunológicos presentes no leite materno do que artigos sobre o conhecimento das mães sobre a importância imunológica do aleitamento natural para o recém-nascido.*

Palavras chave: *Aleitamento materno Conhecimento, Recém-nascido, Sistema imunológico*

Introduction

Breastfeeding is a natural process that provides nutrition to the child, this is an important strategy for creating a relationship between mother and baby. This act allows, in the first hours of newborns (NB) life, a significant reduction in the risk of neonatal death, because of the protective components existing in breast milk. Breastfeeding has numerous benefits for the baby, including the reduction of infant morbidity and mortality in children under five years old, especially protection against infections. Thus, breastfeeding is an important determinant in promoting the integral health of mother and child, in addition to the low cost compared to infant formula, since the only expense is the metabolic energy used to produce milk[1-2].

Breastfeeding should be exclusive until six months of age, without the introduction of other types of liquid or food, except drops or syrups containing

1. Santa Casa de Sao Paulo School of Medical Sciences. School of Nursing. São Paulo - SP - Brazil
2. Santa Casa de Sao Paulo School of Medical Sciences. Department of Pathological Sciences. São Paulo - SP – Brazil
Institution: *Santa Casa de Sao Paulo School of Medical Sciences. School of Nursing. São Paulo - SP – Brazil*
Corresponding Author: *Tainá Mosca. Laboratório de Imunologia - FCMSCSP. Rua Cesário Motta Júnior, 61 – 01221-020 - São Paulo – SP – Brasil*

vitamins, oral rehydration salts, mineral supplements or medications[2].

There are also numerous benefits of breastfeeding for mother, such as decreased risk of breast, ovarian and endometrial cancer, improved mood and reduced stress because of the increased level of oxytocin in the bloodstream during feedings, and well-being feeling, being at the end of the feed, resulting from the release of beta-endorphin in the maternal organism[3]. Published studies have shown that, in addition to the benefits mentioned above, breastfeeding also prevents type 2 diabetes, osteoporosis, weight loss and maternal depression[4]. In the postpartum period, the suction at the time of breastfeeding stimulates the release of oxytocin, which promotes uterine retraction, placental release and decreased postpartum bleeding, which reduces the risk of anemia [3]. During the six months in which the woman is breastfeeding, lactation works as a contraceptive method because of the lactational amenorrhea, preventing at the woman from getting pregnant during this period, as long as there is exclusive breastfeeding and on demand[3-4].

The first months of life are crucial for newborns because of the high probability of mortality and morbidity, as newborns have an immature immune system, making them more vulnerable to infections. The major infections that affect newborns are: otitis media and superior, gastrointestinal infections, sepsis and meningitis. Respiratory infectious diseases are also frequent, caused by rhinovirus, adenovirus, respiratory syncytial virus (RSV), parainflenza and influenza[5-6].

The NB immune system is composed of components that have a limited protective ability against pathogens. The first defense barriers of the NB come from innate immunity: epithelial barriers (skin and mucous membranes), glycoproteins (mucins, cytokines, proteins of the complement system) and circulating cells (phagocytes and natural killer cells), which, in order to be activated, do not need a previous contact with the antigen or pathogen[7,8].

The adaptive immune system is not fully developed or active in a child's first year of life. Thus, at birth, specific protection against pathogens is exercised by the passive transfer of maternal antibodies, which occurs transplacentally during fetal development and, later, through breast milk, during breastfeeding[8-9].

Breast milk has antimicrobial bioactive factors (secretory IgA, lactoferrin, lysozyme, oligosaccharides, mucin, fibronectin and complement system proteins), anti-inflammatory factors (cytokines, catalase antioxidants, lactoferrin, alpha-tocopherol and beta-carotene), antiproteases (alpha1- antitrypsin and elastase inhibitor), growth factors, prostaglandins (E1 and E2), immunomodulators (cytokines, prostaglandins and prolactin) and leukocytes (macrophages, lymphocytes, neutrophils and epithelial cells)[6,10-11]. Many of these protective factors are transferred by breast milk to the NB, these are resistant to the degradation of digestive enzymes, providing protection of the mucosa and elimination of bacterial agents[6].

Immunoglobulin A (IgA) present in breast milk is predominantly the first line of specific defense to the NB. This antibody prevents the entry of microorganisms and antigens into the epithelium, because this binding inhibits microorganism adherence to the respiratory and gastrointestinal mucosa[6,10].

Despite of all these immunological benefits of breast milk for the newborn, many mothers do the weaning before the child is six months old. It is possible that this early weaning is influenced by low maternal knowledge about the immunological importance of breastfeeding for the newborn. Mothers' knowledge about the importance of breastfeeding can directly influence the act of breastfeeding[12-14].

Considering the importance of knowledge of postpartum women in relation to breastfeeding, this study aims to collect data on mothers' knowledge about the immunological importance of breastfeeding for the newborn.

Objectives

General

Get the information available, in scientific articles, related to maternal knowledge about the immunological importance of breastfeeding for the newborn.

Specific

To compile data on immunological aspects of breastfeeding for the newborn, describing the immunological components present in breast milk.

Method

A narrative review of the last twenty years literature. The research was based on the descriptors: breastfeeding, knowledge, mothers, newborn, immune system. The databases used were: Lilacs (Latin American and Caribbean Literature on Health Sciences) and PubMed and the electronic journal: Scielo (Scientific Electronic Library Online). Inclusion criteria were studies published from 2000 to 2020, in full text, in Portuguese, English and Spanish, which related breastfeeding with baby's immune response and mothers' knowledge about the protective importance of breast milk. Scientific articles that did not talk about

the proposed subject and that were published before the year 2000 were excluded.

Results

In the present study, 38 articles were found, 15 of which were about mothers' knowledge of the immunological importance of breastfeeding (Chart 1) and 23 related of the immunological components present in breast milk (Chart 2).

The articles about maternal knowledge were mostly qualitative studies, published from 2011 to 2020 in Brazil. The main knowledge cited were protection against diseases, nine articles (60%) and immunity, five articles (33%).

Regarding the immunological components present in breast milk, 23 articles were found, 22 of which were reviews, published mainly in the years 2000 to 2010. The studies are publications from Brazil (12 articles), the United States of America (8 articles), Portugal (1 article) Sweden (1 article) and Poland (1 article). The main components cited were: IgA (100% of articles cited), leukocytes (82% cited), cytokines (82%), lactoferrin (60%) and lysozyme (52%).

Discussion

The results obtained showed that there are more studies about the immunological components present in milk than studies about maternal knowledge of the immunological importance of breastfeeding. The results also showed that mothers generally know that breastfeeding is important for the immune protection of the baby.

The specific knowledge of the reasons why breastfeeding causes protection, that is, which immunological components are present in milk, however, is apparently not well-known by mothers. The most frequent maternal citations related the immunological importance of breastfeeding: "protection against diseases" and "immunity". In 100% of the analyzed articles, mothers did not mention any immunological component present in breast milk. These results suggest that mothers have relative knowledge of the immunological protection of breastfeeding, even without being aware of the factors present in milk that provide this protection.

A qualitative exploratory study, carried out during the month of April 2014, in a rooming-in in the municipality of Jequié (BA, Brazil), with twelve puerperal women through semi-structured interviews and projective technique, showed that some of the puerperal women had vague knowledge about the components present in breast milk and when asked about the baby's immunity, none was able to report that the transfer of immunobiological factors occurs through breast milk[43]. It is mentioned that the mother's level of knowledge about the importance of breastfeeding

Chart 1

Articles about mothers' knowledge of the immunological importance of breastfeeding for the newborn.

Articles	*Country*	*Research Type*	*Maternal knowledge cited in the article*
Chu et al (2019)[15]	Korea	Qualitative study	"Breastfeeding babies would have a stronger immunity".
Sultania et al (2019)[16]	India	Cross-sectional study	"Gives natural immunity".
Corrêa et al (2019)[17]	Brazil	Qualitative descriptive study	"Breast milk is good for the immune system and boosts the body's defenses against disease".
Cascone et al (2019)[18]	Italy	Cross-sectional study	"Contains antibodies and reduces the risk of infectious diseases".
Lindsay et al (2017)[19]	EUA	Literature review	"Protective effects against disease".
Altamimi et al (2017)[20]	Jordan	Cross-sectional study	"A breastfed child is less likely to get sick".
Gewa et al (2016)[21]	Kenya	Cross-sectional study	"A breastfed child has fewer illnesses".
Visintin et al. (2015)[12]	Brazil	Quantitative descriptive study	"Immune character of breast milk for the child".
Santana et al (2013)[22]	Brazil	Cross-sectional study	"Makes the child resistant to diseases".
Morais et al (2010)[23]	Brazil	Qualitative descriptive study	"Prevents some diseases, avoids allergies".
Silva et al (2005)[13]	Brazil	Qualitative study	"Immune defense of the infant".
Percegoni et al (2002)[24]	Brazil	Qualitative study	"Disease protection".
Sandre-Pereira et al (2000)[25]	Brazil	Descriptive study	"Disease protection".

Chart 2

Articles about immunological components present in breast milk.

Articles	*Country*	*Research Type*	*Components of the Immune System Present in Breast Milk*
Nolan et al (2019)[26]	EUA	Literature review	Soluble IgA, lactoferrin, lysozyme, leukocytes and cytokines.
Rajani et al (2018)[9]	EUA	Literature review	Immunoglobulin A (IgA), cytokines, chemokines, growth factors, oligosaccharides, and leukocytes.
Witkowska-Zimny et al (2017)[27]	Poland	Literature review	Immunoglobulins (A, G, M, D and E), lactoferrin, lysozymes, cytokines, leukocytes.
Palmeira et al (2016)[6]	Brazil	Literature review	Antibodies (especially secretory IgA), lysozyme, lactoferrin, cytokines, lymphocytes, and other leukocytes.
Brugman et al (2015)[28]	EUA	Literature review	IgA, cells and cytokines.
Jakaitis et al (2014)[29]	EUA	Literature review	Antibodies (IgA), phagocytes, lysozyme, lactoferrin, cytokines, and other leukocytes.
Walker et al (2014)[30]	EUA	Literature review	IgA, lymphocytes and cytokines.
Melo et al (2014)[31]	Brazil	Literature review	Immunoglobulin A, enzymes and interferon.
Soares et al (2012)[32]	Brazil	Literature review	Soluble components (IgA, IgM, IgG, IgD, IgE and lysozyme) cellular components (macrophages, lymphocytes, granulocytes, neutrophils and epithelial cells).
Rocha (2010)[33]	Brazil	Literature review	Immunoglobulin A, lysozyme, lactoferrin, cytokines, lymphocytes and other leukocytes.
Passanha et al (2010)[34]	Brazil	Literature review	IgA, immunoglobulins, oligosaccharides, lipids, bioactive peptides.
Silva et al (2009)[35]	Brazil	Literature review	Immunoglobulins (IgA, IgM, IgG), lactoferrin, leukocytes, B and T lymphocytes, cytokines and growth factors.
Cunha (2009)[36]	Portugal	Literature review	Immunoglobulin, complement system, cytokines, lysozyme and lactoferrin.
Antunes (2008)[3]	Brazil	Literature review	Soluble components (IgA, IgM, IgG, IgD, IgE, lysozymes) and leukocytes.
Toma (2008)[37]	Brazil	Literature review	Secretory IgA and bifid factor.
Hanson (2007)[38]	Sweden	Literature review	IgA, IgG, lactoferrin, phagocytes, cytokines and chemokines.
Galvão et al (2007)[39]	Brazil	Case-control study	IgA, IgM, IgD, IgE immunoglobulins, lysozyme, lactoferrin, lymphocytes and other leukocytes.
Jackson et al (2006)[11]	EUA	Literature review	IgA, IgG, leukocytes, lysozyme and lactoferrin.
Araújo et al (2006)[1]	Brazil	Literature review	Antibodies (IgA, IgM, IgE and IgD) and leukocytes (macrophages, neutrophils and eosinophils).
Field (2005)[40]	EUA	Literature review	Immunoglobulins (IgA, IgG, IgM), lactoferrin, lysozyme, cytokines, lymphocytes and other leukocytes.
Hanson et al (2003)[41]	EUA	Literature review	IgA, IgM, IgG, lymphocytes, lactoferrin, cytokines and oligosaccharides.
Calil et al (2003)[42]	Brazil	Literature review	Immunoglobulins (IgG, IgM, IgA and secretory IgA), lactoferrin, leukocytes, cytokines and lysozyme.
Grassi et al (2001)[10]	Brazil	Literature review	Secretory IgA, leukocytes, lactoferrin, lysozyme, fibronectin and cytokines.

is crucial for the continuation of the practice until six months of life, and can extend up to two years of the child, thus contributing to the reduction of infant morbidity and mortality[44].

Guidance on breastfeeding is provided during prenatal care and during childbirth hospitalization. The results suggest that, possibly, the orientation by professionals for the puerperal women is superficial, not clarifying about the components of breast milk that bring immunity to the baby. In a descriptive, cross-sectional study, carried out from December 2016 to June 2017, in a hospital in Minas Gerais, with 69 postpartum women, through a questionnaire, showed that 22 (32.0%) of the postpartum women were guided by nurses[45]. The same study concluded that, during prenatal care, the professional nurse contributes to the construction of an effective process of breastfeeding, with its main attributions being education, counseling, guidance, clarification and home monitoring to form a relationship between mother and her baby, patient safety and adequate preparation for breastfeeding before this practice begins[46].

The results about the immunological components present in breast milk showed that the most observed were: IgA, leukocytes, cytokines, lactoferrin, lysozyme. IgA was cited by 100% of the studies.

The newborn is highly vulnerable to infections, since his immune system is still immature, requiring the passive transfer of antibodies through the mother, for his protection against possible pathogens. During breastfeeding, there is a passive transfer of immunity, because the breast milk is rich in protective components[8]. IgA is an antibody that is part of the first defense line against pathogens present in the respiratory and gastrointestinal mucosa of children. This antibody is transferred from mother to baby through breast milk. IgA acts on cells preventing the invasion and adherence of microorganisms, toxins and other antigens to the intestinal mucosa[6,34].

The other two components most cited in the articles analyzed in the present study were leukocytes and cytokines. Cytokines present in breast milk act as signaling molecules, which participate in immune modulation and protection, and leukocytes are a large group of effector cells of immunity. Innate immunity is represented by macrophages, neutrophils, dendritic cells and natural killer (NK) cells, complement system and natural barriers. Some of these cells act through phagocytosis, release of inflammatory mediators, activation of complement system proteins, as well as synthesis of acute phase proteins, cytokines and chemokines[47].

Lactoferin was found in 50% of the articles, being an important protein that has action against viruses and bacteria due to the affinity for binding with iron molecules, inhibiting the growth of bacteria that need this nutrient[7-8]. Lysozyme, cited by 12 of the studies, is an enzyme that is in higher concentration in mature milk and acts by directly degrading the bacteria external cell wall and, together with lactoferin, acts on gram-positive and some gram-negative bacteria[6].

Breast milk and the breastfeeding is a topic that has been much discussed in recent years, owing to the important impact on children's health. A study reports that discussions in Brazil and in the world, about the importance of breastfeeding, began in the late 1970s; because until then, the nutritional and immunological properties of breast milk were not known, as well as the importance of breastfeeding and of its physiological and emotional repercussions and lower morbidity for the baby and the mother[48].

In the present study, it was observed that the topic of breastfeeding and its components is widely discussed worldwide. It can be identified that mothers from different countries, especially Brazil, apparently do not have knowledge about the immunological components present in breast milk that protect the child. Lack of knowledge about the subject can lead mothers not to breastfeed or to early weaning. It is also suggested that the health professional, who assists the woman during prenatal care, in addition to clarifying the puerperal woman's doubts regarding the importance of breast milk, must inform about the importance of breastfeeding for the child's immune system.

The articles used in the present work, about maternal knowledge of the immunological importance of breastfeeding, are more recent and in less number than the articles about the immunological components present in milk. Thus, there is diverse and consensual information about the immunological components of milk, suggesting the need for more studies about maternal knowledge of the importance of breastfeeding for the development of the infant's immune system.

The present study, because it is a review, does not ensure a strong proposition about the situation of maternal knowledge of the importance of breastfeeding for the NB's immune system. The study represents an indication and suggests the importance of the theme. Thus, we suggest the necessity of study with direct application of a questionnaire on the subject, aimed at mothers.

Conclusions

There are more articles in the literature about the immunological components present in breast milk than articles about mothers' knowledge of the immunological importance of breastfeeding for the newborn. Furthermore, apparently mothers don't

have knowledge of the immunological components present in breast milk.

Authors' contributions: All authors are equally responsible for all stages of the present study.

Conflict of interests: The authors declare that there is no conflict of interest in this study.

References

1. Araújo MFM, Araújo TM, Beserra EP, Chaves ES. O papel imunológico e social do leite materno na prevenção de doenças infecciosas e alérgicas na infância. Rev Rene. 2006; 7(3):91-7.
2. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Saúde da criança: aleitamento materno e alimentação complementar. 2ª. ed. 184 p. (Cadernos de Atenção Básica; n. 23) [Internet]. Brasília(DF): Ministério da Saúde; 2015. [acesso 2021 Ago 17]. Disponível em: http://189.28.128.100/dab/docs/portaldab/publicacoes/saude_crianca_aleitamento_materno_cab23.pdf.
3. Antunes LS, Antunes LAA, Corvino MPF, Maia LC. Amamentação natural como fonte de prevenção em saúde. Ciênc Saúde Coletiva. 2008; 13(1):103-9.
4. Victora CG, Barros AJD, França GVA, Bahl R, Rollins NC, Horton S, et al. Breastfeeding in the 21st century: epidemiology, mechanisms, and lifelong effect. Lancet .2016; 387(10017):475-90.
5. Araújo MFM, Del Fiaco A, Pimentel LS, Schmitz BAS. Custo e economia da prática do aleitamento materno para a família. Rev Bras Saúde Matern Infant. 2004; 4(2):135-41.
6. Palmeira P, Sampaio MC. Immunology of breast milk. Rev Assoc Med Bras. 2016; 62(6):584-93.
7. Rabet LM, Vos AP, Boehm G, Garssen J. Breast-feeding and its role in early development of the immune system in infants: consequences for health later in life. J Nutr. 2008; 138(9):1782S-90S.
8. Diniz LMO, Figueiredo BCG. O sistema imunológico do recém-nascido. Rev Méd Minas Gerais. 2014; 24(2):233-40.
9. Rajani PS, Seppo AE, Järvinen KM. Immunologically active components in human milk and development of atopic disease, with emphasis on food allergy, in the pediatric population. Front Pediatr. 2018; 6:218.
10. Grassi MS; Costa MTZ; Vaz FAC. Fatores imunológicos do leite humano. Pediatria (São Paulo). 2001; 23(3):258-63.
11. Jackson KM, Nazar AM. Breastfeeding, immune response and long-term health. J Am Osteopath Assoc. 2006; 106(4):203–7.
12. Visintin AB, Primo CC, Amorim MHC, Leite FMC. Avaliação do conhecimento de puérperas acerca da amamentação. Enferm Foco. 2015; 6(1/4): 12-6.
13. Silva LR, Vieira G, Dias CPF, Santos DRD, Ferraz F, Carneiro G, et al. Conhecimento materno sobre aleitamento: um estudo piloto realizado em Salvador, Bahia visando à elaboração de uma cartilha educativa. Rev Cienc Méd Biol. 2005; 4(3):187–94.
14. Silva LS, Mendes FC. Motivos do desmame precoce: um estudo qualitativo. Rev Baiana Enferm. 2011;25(3):259-67.
15. Chu K, Sheu S, Hsu M, Liao J, Chien J. Breastfeeding experiences of taiwanese mothers of infants with breastfeeding or breast milk jaundice in certified baby-friendly hospitals. Asian Nurs Res (Korean Soc Nurs Sci). 2019; 13(2):154-60.
16. Sultania P, Agrawal NR, Rani A, Dharel D, Charles R, Dudani R. Breastfeeding knowledge and behavior among women visiting a tertiary care center in India: a cross-sectional survey. Ann Glob Health. 2019; 85(1):64.
17. Corrêa LF, Souza AS. Percepção de mães primíparas sobre os benefícios da amamentação. Rev Pró-UniverSUS. 2019; 10(1):93-6.
18. Cascone D, Tomassoni D, Napolitano F, Giuseppe GD. Evaluation of knowledge, attitudes, and practices about exclusive breastfeeding among women in Italy. Int J Environ Res Public Health. 2019; 16(12):2118.
19. Lindsay AC, Le Q, Greaney ML. Infant feeding beliefs, attitudes, knowledge and practices of Chinese immigrant mothers: an integrative review of the literature. Int J Environ Res Public Health. 2017; 15(1):21.
20. Altamimi E, Nsour RA, Dalaen DA, Almajali N. Knowledge, attitude, and practice of breastfeeding among working mothers in South Jordan. Workplace Health Saf. 2017; 65(5):210-8.
21. Gewa CA, Chepkemboi J. Maternal knowledge, outcome expectancies and normative beliefs as determinants of cessation of exclusive breastfeeding: a cross-sectional study in rural Kenya. BMC Public Health. 2016; 16:243.
22. Santana JM, Brito SM, Santos DB. Amamentação: conhecimento e prática de gestantes. Mundo Saúde. 2013; 37(3):259-67.
23. Morais TC, Freitas PX, Neves JB. Percepção das primigestas acerca do aleitamento materno. Rev Enferm Integr. 2010; 3(2):621-7.
24. Percegoni N, Araújo RMA, Silva MMS, Euclydes MP, Tinôco ALA. Conhecimento sobre aleitamento materno de puérperas atendidas em dois hospitais de Viçosa, Minas Gerais. Rev Nutr. 2002; 15(1):29-35.
25. Sandre-Pereira G, Colares LGT, Carmo MGT, Soares EA. Conhecimentos maternos sobre amamentação entre puérperas inscritas em programa de pré-natal. Cad. Saúde Pública. 2000; 16(2):457-66.
26. Nolan LS, Parks OB, Good M. A review of the immunomodulating components of maternal breast milk and protection against necrotizing enterocolitis. nutrients. 2019; 12(1):14.
27. Witkowska-Zimny M, Kaminska-El-Hassan E. Cells of human breast milk. Cell Mol Biol Lett. 2017; 22:11.
28. Brugman S, Perdijk O, van Neerven RJ, Savelkoul HF. Mucosal immune development in early life: setting the stage. Arch Immunol Ther Exp (Warsz). 2015; 63(4):251-68.
29. Jakaitis BM, Denning PW. Human breast milk and the gastrointestinal innate immune system. Clin Perinatol. 2014; 41(2):423-35.
30. Walker WA, Iyengar RS. Breast milk, microbiota, and intestinal immune homeostasis. Pediatr Res. 2015; 77(1-2):220-8.
31. Melo CS, Gonçalves RM. Aleitamento materno versus aleitamento artificial. EVS. 2015; 41:7-14.
32. Soares RCS, Machado JP. Imunidade conferida pelo leite materno. Científica Univiçosa. 2012; 4(1):205-10. (Anais SIMPAC. Trabalho apresentado no 4º Simpósio de Produção Acadêmica).
33. Rocha S. Os benefícios do leite materno. Revista da Faculdade de Ciências da Saúde. 2010; 7:204-16.
34. Passanha A, Cervato-Mancuso AM, Silva MEMP. Elementos protetores do leite materno na prevenção de doenças gastrintestinais e respiratórias. Rev Bras Crescimento Desenvolv Hum. 2010; 20(2):351-60.
35. Silva DRN, Schneider AP, Stein RT. O papel do aleitamento materno no desenvolvimento de alergias respiratórias. Sci Med. 2009; 19(1):35-42.
36. Cunha MA. Aleitamento materno e prevenção de infecções. Rev Port Clin Geral. 2009; 25(3):356-62.
37. Toma TS, Rea MF. Benefícios da amamentação para a saúde da mulher e da criança: um ensaio sobre as evidências. Cad Saúde Pública. 2008; 24(Supl. 2):235-46.
38. Hanson LA. Session 1: Feeding and infant development breast-feeding and immune function. Proc Nutr Soc. 2007; 66(3):384-96.
39. Galvão A, Lorenzo D, Barreira L, Oliveira M, Furtado R, Mota R, et al. Aleitamento materno como protetor de hospitalização

em lactentes. Gaz Méd Bahia. 2007; 77(Supl. 1):2-7.
40. Field CJ. The immunological components of human milk and their effect on immune development in infants. J Nutr. 2005; 135(1):1-4
41. Hanson LA, Korotkova M, Lundin S, Haversen L, Silfverdal SA, Baltzer IM, et al. The transfer of immunity from mother to child. Ann NY Acad. 2003; 987(1):199-206.
42. Calil VMLT, Falcão MC. Composição do leite humano: o alimento ideal. Rev Med. 2003; 82(1-4):1-10.
43. Santos RPB, Araújo RT, Teixeira MA, Ribeiro VM, Silva LA, Araujo VM. Importância do colostro para a saúde do recém-nascido: percepção das puérperas. Rev Enferm UFPE On line. [Internet]. 2017 [citado 2020 Set 12]; 11(supl 9):3516-22. Disponível em: https://periodicos.ufpe.br/revistas/revistaenfermagem/article/view/234481/27672
44. Diogo EF, Souza T, Zocche DA. Causas do desmame precoce e suas interfaces com a condição socioeconômica e escolaridade. Enferm Foco. 2011; 2(1):10-3.
45. Aleixo TCS, Carleto EC, Pires FC, Nascimento JSG. Conhecimento e análise do processo de orientação de puérperas acerca da amamentação. Rev Enferm UFSM. 2019; 9(59):1-18.
46. Ferreira GR, Lima TCF, Coelho NMD, Grilo PMS, Gonçalves RQ. O papel da enfermagem na orientação do aleitamento materno exclusivo. Rev Conexão Eletrônica. [Internet]. 2016 [citado 2020 Set 12]; 13(1):1-18. Disponível em: http://www.aems.edu.br/conexao/edicaoanterior/Sumario/2016/downloads/1.%20Ci%C3%AAncias%20Biol%C3%B3gicas%20e%20Ci%C3%AAncias%20da%20Sa%C3%BAde/070_Inicia%C3%A7%C3%A3o%20-%20O%20Papel%20da%20Enfermagem....pdf
47. Cruvinel WM, Mesquita Júnior D, Araújo JAP, Catelan TTT, Souza AWS, Silva NP, et al. Sistema imunitário – Parte I Fundamentos da imunidade inata com ênfase nos mecanismos moleculares e celulares da resposta inflamatória. Rev Bras Reumatol. 2010; 50(4):434-61.
48. Gomes JMF, Carvalho MCVS, Ferreira FR, Vargas EP. Amamentação no Brasil: discurso científico, programas e políticas no século XX. In: Prado SD, Amparo-Santos L, Silva LF, Arnaiz MG, Bosi MLM. Estudos socioculturais em alimentação e saúde: saberes em rede. [Internet]. Rio de Janeiro: EDUERJ; 2016. v. 5, p. 475-91. (Sabor metrópole series). [citado Jul 12 2021]. Disponível em: http://doi.org/10.7476/9788575114568.

Article received: July 01, 2021
Article approved: March 14, 2022
Article published: March 14, 2022

Responsible Editor: Prof. Dr. Eitan Naaman Berezin (Editor-in Chief)