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Short Communication

Breastfeeding: Importance in Early Development of the Immune System and Long-term Health

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I N F O

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A B S T R A C T

Breastfeeding supplies the baby and infant with unparalleled natural nutrients. Human breast milk also has several antimicrobial agents and may influence immune system development, as evidenced by prior research on newborn immunisation response and thymus gland development.

Human milk is a dynamic supply of nutrients and bioactive ingredients and promotes the healthy growth and development of the human newborn. Infants are more susceptible to infection because their developing immune systems have a number of weaknesses. This review focuses on the direct effect of human milk on innate immunity in infants. Numerous new studies have made the multi-functionality of the bioactive components of human milk very clear. Our knowledge of the potential positive effects of human milk on infants has increased. These effects are not achievable with milk formulae.

Human milk contains antimicrobial proteins and peptides that have a broader involvement in innate immune defence than previously thought. A complex combination of the anti-inflammatory and antioxidative substances that human milk supplies to the intestine results in a special environment of improved immune defence with reduced inflammation.

Keywords: Breastfeeding, Breast Milk, Immune System, Development

Introduction

The food that is best suited to satiating a human baby's nutritional demands is breast milk. It is simple to digest and contains all the essential elements in the ideal proportions. In addition to its nutritional advantages, breast milk also strengthens and supports a baby's immune system.[1]

Antibodies in breast milk have the ability to combat illness. Colostrum, the first milk produced after childbirth, contains significant concentrations of such antibodies. However, antibodies remain in breast milk for the complete breastfeeding duration of a mother. The mother can provide some immunity against current and future infectious diseases through these antibodies. Babies can literally get a head start in preventing and fighting illnesses with the help of breast milk.[2]

Additionally, breast milk contains additional proteins, lipids, carbohydrates, and even white blood cells that function in a variety of ways to fight infection. Given that breast milk travels directly to the stomach and intestine when your baby eats, it is particularly useful in the battle

against gastrointestinal infections. Before being digested and reaching the complete body, the various components of breast milk function directly within the intestine. This prepares the body for a strong immune system that functions properly and protects against infections and other disorders long after nursing stops.[3]

There are additional components in breast milk that directly nourish and stimulate the immune system. These contain interleukin -6, -8, and -10 as well as lactoferrin. The immune system's inflammatory response, which is necessary for immunological function but can be harmful in excess, is regulated by these proteins.[1]

Breast milk also contains "probiotic" components. Some aid the immune system, while others act as a food supply for the good bacteria that make up the human microbiome. In addition to infection prevention, a healthy microbiome can reduce the risk of allergies, asthma, obesity, and other chronic diseases over the course of a person's lifetime.[4]

It is not unexpected that breastfed kids are less likely to experience ear infections, vomiting, diarrhoea, pneumonia, urinary tract infections, and some types of meningitis given the abundance of immunity-enhancing components in breast milk. Additionally, studies reveal that compared to children who drink formula, those who nurse for longer than six months have a lower risk of developing childhood lymphoma and leukaemia. This may be partially due to the fact that immune system disturbances might impact certain cancer types.[4]

According to a UNICEF survey, despite the fact that 79% of women give birth in a medical facility, only 41.6% of newborns in India are nursed within an hour of birth and roughly 95% of children in India were breastfed at some point in the previous year.[4] According to the report, 7.6 million babies worldwide are not breastfed each year. It was also mentioned that despite the fact that breast milk provides protection against diseases to mothers and children, boosts IQ and improves educational achievements for children and mothers, an estimated 21% of infants in high-income nations are never nursed. The rate is 4% in low- and middle-income nations, and babies from the poorest families are 1.5 times more likely to be breastfed at an age of 2 years than those from the richest families.[4]

Breastfeeding and Immune System Development

An essential part of the immune system, the thymus, is in charge of T lymphocyte development. Thymocytes, or immature T cells, go through selection in the thymus to weed out potentially self-reactive cells. Less than 5% of thymocytes make it through this "education" and are then liberated as circulating T cells that are functionally mature. Although the clinical importance of thymic size is unknown, breastfeeding may have a direct impact on a critical immune system organ because of the thymus gland's essential role in the development of the T-cell repertoire.[2]

It was discovered in a study that at 4 months of age, infants who were completely breastfed had considerably larger thymus glands than those who were only formula fed or partially breastfed.[1] This was determined using an ultrasound technique to quantify thymic index size. At birth, there was no discernible variation in thymic size between the three research groups.[2]

By measuring the weights of the thymus at autopsies of children who had died of sudden infant death syndrome, a few researchers later tried to validate the results mentioned above[1] but could not succeed.[2]

Breast Milk: A Key Factor in Immune System Development

As the first meal to which newborns are exposed, breast milk is a crucial conduit for the transmission of the mother's immunological memory to the child. It contains a number of biologically active antimicrobial peptides (AMPs), including defensins and cathelicidin, as well as immune-modulating substances that boost active and passive immunity during the developing years of life.[1]

Cathelin, released after neutrophil degranulation, is generated from its inactive proform cathelicidin (an AMP) which is stored in the granules of neutrophils. Cathelicidin's function as a mediator between innate and adaptive immunity is revealed by a number of actions including endotoxin neutralisation, angiogenic, chemotactic, and wound healing.

Probiotics and oligosaccharides found in breast milk contribute to the infant's developing gut microbiota, which is essential for the development of the immune system.[1]

Contribution of Breastfeeding to Physiological Immunity in the Newborn

The newborn's adaptative immune system is immature, inadequate, and ineffective during the first few weeks of postnatal life. Several explanations for the newborn's impaired immunity have been put forth, including the immaturity of immune cells or lymphoid tissues. As a result, there is an increased risk of contracting infections and getting sick or dying. In fact, the neonate's exposure to a new environment with a complex microbial ecosystem outside of the womb is thought to be a significant and perilous change during birth. Additionally, particularly in the first few months of life, neonates exhibit decreased responsiveness to immunisation while also having increased susceptibility to diseases. Notably, the infant gains immunity to respond to any risky external diseases through the transmission of maternal immune components via breast milk, improving

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their fitness for survival.[5] According to early findings, women transmit antibodies in the colostrum during the first two to four days after breastfeeding, providing passive immune protection. Also, experimental evidence in human and murine models confirms several mechanisms involved in maternal immune transference to the newborn, such as maternal leukocyte transfer (MLT), and microchimerism, the infiltration of maternal cells in newborn tissues.[1]

Additionally, a mechanism of immunological tolerance known as self-missing, mediated by neonatal natural killer cells, along with the de novo synthesis of neonatal immunoglobulin A (IgA), plays an important role in the maintenance of intestinal microbiota. Notably, the immunological component of breast milk appears to combine peripheral output that does not necessarily coincide with blood levels with local secretion from various cell types. We suggest that breastfeeding by the mother aids physiological pathways that contribute to the infant's immunity.[6]

Contribution of Breastfeeding to Cognitive Development of the Newborn

Infants' cognitive development is influenced by psychosocial influences, heredity, and their interactions.[4] An increasing amount of attention is being paid to how parenting and emotional relationships between the mother and child affect an infant's cognitive development.[7]

Infants gain nourishment, immunity, and illness prevention from breastfeeding. It enhances the mother-emotional baby's connections and cognitive development.[7]

Association of Breastfeeding with Social and Emotional Development in Children

There is proof that nursing affects a child's social and emotional growth. There is research to support the idea that different newborn temperaments are related to the breastfeeding experience. For instance, breastfed infants are reportedly more likely to exhibit undesirable effects by the time they are 3 months old as compared to formula-fed newborns.[7] The prolonged duration of breastfeeding in infancy has also been linked to bad temperaments, such as fussiness.[8]

Conclusion

Breastfeeding has been linked to better cognitive function and socio-affective responses in children. Fatty acids (LC-PUFAs) found in breast milk and their possible positive impact on brain development during infancy, particularly regarding the development of white matter tracts, are likely linked to improved cognitive performance in children. The stimulation of the oxytocin system and oxytocin's known involvement in enhancing good effect and approach behaviours while reducing stress and avoidance behaviour may be the cause of the enhanced socio-affective responses observed in breastfed infants. Breastfeeding dramatically lowers physiological and subjective stress in mothers and enhances maternal care and sensitivity. Again, the impacts on a mother's psychology and behaviour are probably best understood in terms of the oxytocin system.

Conflict of Interest: None

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