

# Breastfeeding Benefits: A Comprehensive Review of Maternal and Infant Health Outcomes

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## ABSTRACT

The current review examines numerous breastfeeding's consequences on health of baby and mother. Breastfeeding is an important step to be taken by every mother which could be a boon for the baby in providing proper growth and immunity, especially for the first six months. It also helps in creating a strong bond between parent and child. Infants' entire health, including their immune systems is benefited by breast milk's immunological properties, microbes and nutritional components. The review also discussed the factors that affect how long and exclusively a woman breastfeeds, classifying these factors into social, biological, biological, psychological and hospital-related variables. The importance of supportive language and healthcare interventions is emphasized. Furthermore, the review delves into the psychological, cognitive and brain development impacts of breastfeeding on children. It underlines the possible links between autism spectrum condition and nursing, as well as the positive cognitive, neurological and social-emotional results associated with breastfeeding. The effects of nursing on maternal affect, mood and postpartum depression were also explored in this review. It concludes by underscoring the need for a comprehensive approach to promoting successful breastfeeding, considering the diverse factors that influence both infant and maternal health.

**Keywords:** Breastfeeding, Benefit, Milk, Challenges, Remedies.

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## INTRODUCTION

The newborn and infant periods are critical times for breastfeeding since it helps to develop a close relationship between the nursing parent and the infant. For the first six months of an infant's life, breast milk is the only source of nutrition that is advised.<sup>1</sup> Hormones like oxytocin and prolactin regulate milk production and the let-down reflex, with milk production happening in stages.<sup>2</sup> The initial milk is colostrum, high in protein and immunoglobulins, followed by a transition to higher lactose content after birth. It is recommended to begin giving Vitamin-D supplements within the first few hours of life and gradually raise the dosage. Lactation follows a pattern driven by the baby nursing and emptying the breast.<sup>3</sup> Successful breastfeeding requires a close relationship to develop between the lactating parent and

kid. The breast crawl and early skin-to-skin contact after birth are important in stimulating breastfeeding. Effective breastfeeding requires the baby to be in the correct position, latch on and have parental support. The amount of milk produced is determined by the baby's ability to empty the breast. Successful breastfeeding beginning requires addressing barriers like discomfort, anxiety and personal instability. Lactation consultants, healthcare professionals and supportive individuals play significant roles in education and assistance. Correct nipple latch is essential and any issues should be addressed promptly. Medication use during breastfeeding should be monitored and managed, usually without requiring complete cessation of breastfeeding.<sup>4</sup> Colostrum serves as the infant's first immunization, protecting the digestive tract through mucosal immunity. Breast milk contains beneficial microbiota, offers nutritional elements and helps protect against infections. Lactoferrin in breast milk defends against various infections. Breast milk is categorized into foremilk and hind milk, each with distinct components.<sup>5</sup> Breastfeeding has numerous benefits, such as reducing the risk of infections, asthma, diabetes, allergies and obesity. Breastfeeding experts provide education



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and support for the breastfeeding dyad. Positive language and support from healthcare professionals is essential for promoting breastfeeding confidence. Postpartum mental health issues should be considered and managed in relation to breastfeeding. Lactation consultants are trained professionals who offer guidance and support for successful breastfeeding. They should be involved during the hospital stay and after discharge.<sup>6</sup>

## FACTORS AFFECTING BREAST FEEDING

Five factors play a key role which affects breastfeeding. They are;

### Demographic Factors

Breastfeeding duration by race is longer among college-educated, high-income mothers of older children, possibly due to the positive effects of acculturation and programmes like WIC (Women, Infants and Children).<sup>7</sup>

### Biological Factors

Maternal obesity and smoking impact breastfeeding duration. Insufficient milk supply and perceived supply issues also play a role.

### Attitudinal Characteristics

Extended breastfeeding has been linked to high mother self-efficacy. The amount of time a woman spends learning about and really doing breastfeeding has a beneficial impact on her confidence in her ability to do so. The length of breastfeeding also depends on the mindset of the mothers. When compared to individuals who believe breastfeeding to be constrictive, painful and difficult, those who believe it to be healthier, easier and more convenient nurse for longer periods of time.

### Hospital Practices

Early initiation, rooming-in and exclusive breastfeeding support affect duration. Clinicians' recommendations impact breastfeeding choices.

### Social Variables

Maternal employment and support from partners, fathers and others affect breastfeeding. Face-to-face support is more effective.<sup>8</sup>

## COMPOSITION OF HUMAN BREAST MILK

Carbohydrates, protein and fat are all present in human breast milk, in addition to vitamins, minerals, digestive enzymes and hormones. It has a high concentration of bioactive chemicals and immune cells like macrophages. There are protein- and lipid-derived bioactive compounds, as well as protein-derived and indigestible molecules like oligosaccharides.<sup>9</sup> The composition of human breast milk is illustrated in Figure 1.

To prevent the spread of bacteria like Salmonella, Listeria and Campylobacter in a baby's digestive system, Human Milk

Oligosaccharides (HMOs) flood the area with decoys that bind the pathogens and keep them away from the intestinal wall. In addition, oligosaccharides aid in colonizing up to 90% of the developing biome, which is essential for the development of a healthy innate and adaptive immune response. Figure 1 shows the components of human breast milk.<sup>10</sup>

## Pumping of Breast Milk

Breastfeeding mothers may need to express the breast milk using a pump. Breast milk expression has various benefits. Breast milk production is subject to the laws of supply and demand. While the mother is at work, running errands, or if infant is unwell and has temporarily stopped nursing, pumping is a method to keep breasts consistently stimulated.<sup>11</sup>

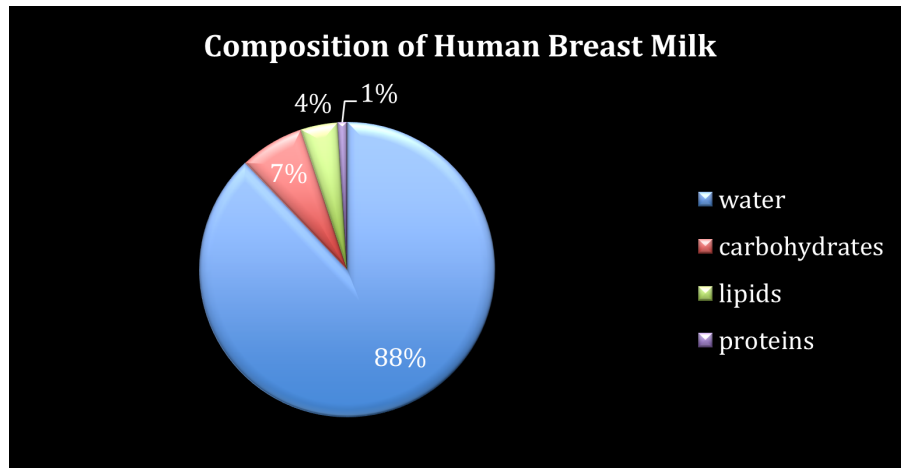
## ADVANTAGES OF BREASTFEEDING

A newborn receives the best nourishment from breast milk, which also promotes growth and development. Additionally, breastfeeding can assist mom and the baby ward off several ailments and disorders. The body of knowledge and caliber of the study on health consequences continue to grow and multiple review papers outlining the evidence for breastfeeding's contribution to the best possible health outcomes have been published.<sup>12</sup> Some short- and long-term illnesses and diseases can be warded off by breastfeeding a baby. Breastfed infants have lower rates of illness and death from conditions like asthma, obesity and type-1 diabetes. The majority of newborns receive the highest nourishment from breast milk.<sup>13</sup> Breast milk is a vital means by which antibodies can be transferred from mother to child. The risk of developing ovarian cancer, breast cancer, type-2 diabetes and high blood pressure is reduced in breastfeeding mothers.<sup>14</sup> The advantages of breastfeeding are detailed in illustrated 2.

## STORAGE OF BREAST MILK

Extracted milk can be used right away or kept securely for later use. Storage conditions subjected to change for newborns that are preterm or unwell. A clean container or a disposable milk storage bag should be used to store milk. Wastage of milk was reduced by storing 2-4 ounces of milk in each container. An airtight seal was ensured by using a solid cap and the bottle was soaked in a basin of hot water (or rinsed under running water) until the milk was at room temperature. The process of rapidly heating milk has been found to result in the degradation of its nutritional content, while also posing a potential risk of causing thermal injuries to a baby's oral cavity.<sup>15</sup>

It is recommended to employ clean, food-grade containers or specialized breast milk storage bags for the purpose of storing expressed milk. It is important to ensure that the containers are fabricated from either glass or plastic materials and that the lids possess a secure and tight fit. The expressed or pumped milk is



**Figure 1:** Composition of Human Breast Milk.

kept at a temperature of 77°F or lower for 4 hr, it will not spoil. The maximum duration for refrigeration is four days.<sup>16</sup>

## PSYCHOLOGICAL EFFECTS OF BREASTFEEDING IN CHILDREN

### Infant and Child Cognitive Development when Breastfed

Multiple studies in different nations have found that breastfeeding is associated with better cognitive outcomes in children.<sup>17</sup> Researchers have shown that children who were breastfed more frequently and for longer periods of time as infants had superior cognitive results throughout their formative years.<sup>18</sup> It has also been proposed that beginning nursing promptly after birth can lower the chance of cognitive deficits.<sup>19</sup> While there is evidence that early breastfeeding might influence cognitive development, causation cannot be firmly established.<sup>20</sup>

### Breastfeeding and Brain Development in Children

The use of Electroencephalography (EEG) and Magnetic Resonance Imaging (MRI) in studies of breastfeeding's effect on cognitive growth has been well documented.<sup>21</sup> Breastfeeding, according to an analysis of EEG spectral power in babies, delays the peak of myelination in the brain compared to formula feeding, which may influence different developmental trajectories.<sup>22</sup>

Total brain volume, cortical thickness and white matter volume all increase with longer durations of nursing.<sup>23</sup> Research indicates that breastfeeding affects myelination timing, influencing white matter tract development, especially in regions tied to higher-order cognitive and socio-emotional functions.<sup>24</sup> Longitudinal research shows that breastfeeding leads to a prolonged white matter development window compared to formula feeding and the existence of DHA (Docosahexaenoic Acid) and ARA (Arachidonic Acid) in formula aids but does not entirely replicate breastfeeding's effects.<sup>25</sup> These findings highlight the role of elements in breast milk, particularly LC-PUFAs (Long-chain

polyunsaturated fatty acids) in enhancing myelination patterns. However, additional factors beyond nutrients seem to contribute to breastfeeding's impact on brain development. Possible causes include mother-infant interactions and nutrients found only in breast milk that are missing from formula.<sup>26</sup>

### Breastfeeding and Social and Emotional Development in Children

Breastfeeding has been shown to have positive effects on children's cognitive and brain development.<sup>27</sup> However, there is also evidence that it influences children's social and emotional development. Breastfeeding may influence an infant's temperament, according to certain studies. At 3 months of age, for instance, breastfed children have been found to exhibit more negative affect than formula-fed infants.<sup>28</sup> Also linked to longer nursing durations in infants is a negative disposition, such as fussiness.<sup>29</sup> The opposite was discovered in a different study, which revealed that mothers perceived their breastfed children to have more "vigour" at the age of 3 months, as evidenced by increased approach and activity.<sup>30</sup> This suggests that the results of studies examining the link between breastfeeding and a variety of personality traits are inconsistent. Breastfeeding has also been shown to have a calming effect on children, according to the literature.<sup>31</sup> Parental reports of antisocial and aggressive behaviour in kids aged 4-11 have been demonstrated to decline with the length of time those kids were breastfed.<sup>32</sup> One's antisocial tendencies may be affected by these factors far into adulthood.<sup>33</sup> A research that followed adults from the time they were 20 until they were 40 found that those who were not breastfed as infants were more likely to exhibit hostile (aggressive) behaviour than those who were.<sup>34</sup>

Furthermore, there is mounting evidence that suggests Autism Spectrum Disorder (ASD), a neurodevelopment illness characterized by social deficits, may be linked to either the lack of or a brief duration of exclusive breastfeeding.<sup>35</sup> According to a recent meta-analysis of more than 2,000 children, children with



**Figure 2:** Advantages of Breast Feeding.

ASD were much less likely to have been nursed than neurotypical children. The Advantages of Breast Feeding is illustrated in Figure 2.<sup>36</sup>

### Breastfeeding's impact on kids' mental and social growth is something to think about

Breastfeeding has been linked to less instances of antisocial behaviour and abnormal social development like autism spectrum disorder, as well as increased cognitive ability and facilitated brain growth. However, there are a number of considerations to make before diving into this area of study.<sup>37</sup>

To begin, it is challenging to compare studies since the independent variable, breastfeeding, is generally measured differently between studies. Some of the studies looked at breastfeeding as a continuous (quantitative) measure, such as the percentage of meals still breastfed or the length of time the baby was exclusively breastfed, while others looked at it as a dichotomous (qualitative) measure, comparing breastfeeding and not breastfeeding. Another group of studies examined the effects of breastfeeding on several outcome indicators and they discovered that the timing of breastfeeding initiation was a crucial contributor.<sup>38</sup>

### EFFECTS OF BREASTFEEDING ON MOTHERS' EMOTIONS, MOODS AND STRESS

Breastfeeding has been shown to improve mothers' mental health, reduce stress and boost their self-esteem. Compared to formula-feeding mothers, those who breastfeed their children generally report reduced levels of anxiety, negative mood and stress. Breastfeeding has been linked to reduced stress in mothers, as measured by changes in vagal tone, blood pressure and heart

rate. Furthermore, the quality of their sleep improves and their cortisol responses to social stress diminish. Breastfeeding mothers may be better able to read and respond to the emotions of others around them, leading to more harmonious relationship.

### Breastfeeding and Mother-Infant Attachment:

Furthermore, breastfeeding appears to impact mother-infant attachment. Breastfeeding mothers tend to be more responsive, engage in more touch and share more mutual gaze with their infants. Studies have found that longer periods of nursing are associated with more maternal sensitivity, greater attachment security and less attachment disorganization in newborns. There may not be a direct causal association between nursing and attachment quality but rather one that is mediated by mother sensitivity.<sup>39</sup>

### Breastfeeding and postpartum depression

Breastfeeding's role in postpartum depression is complex. Evidence indicates that breastfeeding behavior and maternal mood are interconnected. Breastfeeding mothers often display lower depression scores and there's a reciprocal relationship where maternal mood affects breastfeeding behavior. Mothers with higher depression and anxiety levels tend to breastfeed less exclusively and cease breastfeeding earlier. Breastfeeding and maternal mood interact in complex ways, making it difficult to attribute cause and effect.

### TOP CHALLENGES THAT BREASTFEEDING MOTHERS FACE

Breast milk was a fantastic source of nourishment for infants, providing them with vitamins, antibodies, lipids, protein and other nutrients while also enhancing their immune systems.



Medical authorities recommended nursing exclusively for six months before introducing other meals to the infant. Breastfeeding had significant difficulties even though it was natural. These difficulties often caused new moms a lot of stress or shame. It is important to remember that aid was available for those who found themselves in this circumstance and they were not alone. An excellent source of knowledge and instruction could be found from doctors, midwives and the breastfeeding staff at the neighborhood hospital. Here were some of the most prevalent issues nursing women encountered, along with some solutions.

### **Nipple Pain**

Breastfeeding women most frequently stop because of pain. Sore nipples are one of the potential reasons of discomfort that women may experience during, after, or both times they nurse. Mild pain is typical during the initial weeks of breastfeeding as their baby and body adjusts to nursing. However, it should never be excruciatingly painful or appear as though their nipples are hurt. Instead of placing their lips directly on the nipple, babies suckle by pushing their mouths around the areola. The major reason for discomfort is improper latching, or when baby cannot correctly adhere to the breast nursing pillows were often attempted, ensuring that the nipple was in the right place and tilting the baby's head back a bit were some options that were tried to fix this. If that didn't work, a lactation professional was consulted as soon as possible. Trying not to push through the discomfort was advised. Doing so could simply have made things worse and made the mother more frustrated.<sup>40</sup>

### **Low milk supply**

A powerful milk-ejection response, often known as a forceful letdown, was another issue with milk that many women encountered. Their breasts would leak too much milk all at once and their infants would frequently sputter or choke when they started feeding. They could unlatch their infants and allow the extra milk to run onto a cloth, or they could use their palm or fingers to stem the flow of milk. For feeding, they could also try sleeping on their side. Too little milk was more concerning than too much; newborns needed to be fed 8-12 times per day. After feeding, their breasts should have felt softer as well.<sup>41</sup>

### **Sore Breasts**

It had been a common breastfeeding difficulty for women in the first week of nursing. The main cause of nipple discomfort had typically been a baby who did not get enough areola and nipple into the mouth. They had to force their infants to open their mouths wide as they brought them to their breasts. They needed to verify if their areola was largely covered by their baby's mouth. Parents would place a clean finger in the baby's mouth corner to break the suction if the baby was merely sucking on the

breast. Then, before putting the baby back on the nipple, they'd encourage him to open his mouth as wide as they could.<sup>42</sup>

## **STUDY INSIGHTS**

### **Breast Milk Expression and Attitudes Among Working Mothers**

According to the 2018 Baby Friendly Hospital Initiative recommendations, at least 80% of mothers of both preterm and full-term infants should be able to describe or show the process of milk expression. The percentage of women who felt they had adequate knowledge about pumping and storing breast milk was 34%. Knowledge was higher among individuals who regularly expressed milk (47%) than those who did not (25%). Having tertiary education had an Odds Ratio (OR) of 4.5 (95% CI 2.01, 11.07) and working in the public sector had an or of 2.26 (95% CI 1.33, 3.85), both of which were significantly associated with a higher likelihood of having satisfactory knowledge. Higher education was associated with more knowledge regarding breast milk expression in a 2016 research of 499 women in Saudi Arabia ( $p < 0.001$ ). One possible explanation for this is that more women now have the means to buy breast pumps and other equipment for storing and transporting breast milk.<sup>43</sup>

Positive opinions towards breast milk expression and preservation were reported. The vast majority of respondents (83%) were aware that consuming just breast milk for the first six months of life is optimal for both the baby and the mother. Also, 76% thought it was fine for newborns to drink their mothers' expressed milk. Working mothers are optimistic that they can achieve exclusive breastfeeding with the help of milk expression and storage. However, half of the moms in the poll said that expressing milk hurt and the other half said it was a hassle. Working mothers in Kenya identified a lack of time as a barrier to milk expression, with the hand expression technique being seen as particularly time-consuming.<sup>44</sup> Notably, there study did not delve into knowledge of manual expression techniques.

The percentage of working moms who expressed and stored breast milk was 41% in this study, compared to 19% in a 2016 Kenyan study and 37% in a 2018 Nigerian study.<sup>45</sup> Note that these other studies used different methods of inquiry than we did and that we zeroed in on working women who were breastfeeding infants under six months old. Even though 36% of workplaces offer refrigeration, the vast majority of working mothers (77%) prefer to express milk at home. Seventy-five percent of working women said they didn't have the resources they needed to breastfeed at work. Milk expression was most commonly done in order to facilitate exclusive breastfeeding by allowing working mothers to delegate the feeding chore. According to a study of Ghanaian working women, 69% of mother's report receiving no workplace helps following maternity leave.<sup>46</sup> According to the Kenyan Breastfeeding Mothers Act of 2017, employers are required to make reasonable accommodations for breastfeeding

mothers in the workplace, including providing lactation support programmes and mother-friendly policies and providing lactation rooms with adequate seating, small tables, electrical outlets and refrigeration facilities. Breastfeeding assistance programmes can be implemented by businesses of any sizes provided they allocate the necessary time, money and personnel. In India majority of working mothers (60%) had a favorable attitude about feeding infants with expressed breast milk, while just 40% had a negative opinion.

While there is a wealth of knowledge on the safety and efficacy of some alternative and complementary therapies during nursing, the same cannot be said for others due to a lack of study. Medicinal herbs are derived from plants and practiced according to long-established wisdom. The field of Complementary and Alternative Medicine (CAM) encompasses several practices. Acupuncture, nutritional supplements, massage, aromatherapy, homeopathy and relaxation techniques are also part of complementary and alternative medicine. Some traditional and herbal remedies, much like some mainstream medications, may cross the blood-brain barrier and end up in your breast milk. While certain traditional and herbal remedies may influence your ability to breastfeed, others might be detrimental to your unborn child. Do not take a substance that could have an adverse impact on breastfeeding unless you and your practitioner are absolutely certain of this. There are several advantages to nursing, including providing your kid with the healthiest possible nutrition. If your baby was born early or is a new-born, you should exercise extreme caution while using any traditional or herbal remedies during nursing.<sup>47</sup>

## IMPORTANT FACTORS TO EXAMINE

The use of traditional and herbal remedies during nursing raises issues due to their lack of regulation. Breast milk contains all traditional and herbal medications, which means they might potentially harm your infant. There is a lack of sufficient data to establish the safety of herbal and traditional medications during nursing. There is a lack of scientific evidence for the efficacy of several herbal and traditional remedies. Unfortunately, not all products derived from herbs or traditional medicines have been adequately regulated to guarantee their quality.<sup>48</sup>

## CONVENTIONAL HERBAL AND TRADITIONAL REMEDIES<sup>49</sup>

### Aloe Vera

Aloe vera gel is used for the purpose of facilitating the healing process of fissured nipples. Prior to breastfeeding, it is advisable to eliminate aloe gel from the nipple regions due to the potential impact of its bitter taste on the feeding process. Aloe vera latex is a yellow-hued fluid derived from the inner epidermis of the aloe

leaf. It may be ingested orally in either the dehydrated or liquid state. Refrain from consuming aloe vera latex due to its potent laxative properties.<sup>50</sup>

### Cranberry

Cranberry may be used as a preventive measure against urinary tract infections in lactating women. There is a lack of data about the safety and effectiveness of the drug while nursing. However, it is deemed safe to use when taken at the prescribed dosages.

### Echinacea

Echinacea is often used for the treatment or prevention of upper respiratory tract infections. There is a lack of data about the safety and effectiveness of echinacea in relation to breastfeeding. When consuming echinacea while nursing, be vigilant for potential adverse effects in your infant, including diarrhoea, constipation, inadequate eating and skin irritations.

### Fenugreek

Historically, fenugreek has been used to enhance lactation. The extent to which fenugreek is transferred into breast milk is uncertain and there have been reports of uncommon adverse effects in infants, including allergies, colic, gastrointestinal pain and diarrhoea. Additionally, fenugreek has the capacity to interact with other medications.

### Garlic

Garlic is generally considered safe when used in typical culinary quantities. Garlic has the potential to alter the odour of mother's milk and impact your baby's ability to consume it. There is a lack of data about the safety of supplements containing garlic while nursing.

### Ginger

Ginger is generally considered safe when consumed in typical culinary quantities. Refrain from consuming significant quantities of ginger during nursing due to little knowledge on its safety.

### Raspberry leaf

Raspberry leaf is considered safe for use as a tea while nursing. It is advisable to refrain from using raspberry leaf supplements due to the scarcity of safety data available.

### Fennel

Historically used to stimulate lactation and enhance digestive processes. Fennel seeds may be infused to create an herbal tea.

### Alfalfa

Occasionally used to enhance milk production as a result of its abundant nutritional composition.

## CONCLUSION

Breastfeeding plays a pivotal role in promoting optimal neonatal, infant and maternal health. From its initiation in the 1<sup>st</sup> hr after birth to its multifaceted impacts on cognitive, emotional and physical well-being, breastfeeding offers a wide array of benefits. This comprehensive review highlights the complex interplay of factors that influence breastfeeding, from biological and attitudinal characteristics to social variables. It emphasizes the importance of proper education, support and interventions to address these determinants and promote successful breastfeeding experiences. The review underscores breastfeeding's role in cognitive development, brain maturation, social-emotional growth and even its potential implications in preventing autism spectrum disorder. The psychological benefits of breastfeeding for mothers are also highlighted in the review. These benefits include lower stress levels, higher levels of happiness and maybe lessened symptoms of postpartum depression. By understanding the multidimensional impact of breastfeeding on both infants and mothers, healthcare professionals can offer tailored support, foster strong maternal-infant bonds and contribute to better overall health outcomes. Ultimately, this comprehensive exploration reinforces the importance of a holistic approach to breastfeeding promotion and underscores the need for ongoing research to unravel the intricate connections between breastfeeding and health across the lifespan.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

## ABBREVIATIONS

**HMO:** Human Milk Oligosaccharides; **EEG:** Electroencephalography; **MRI:** Magnetic Resonance Imaging; **LC-PUFA:** Long-chain polyunsaturated fatty acids; **ASD:** Autism Spectrum Disorder; **CAM:** Complementary and Alternative Medicine.

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