

Bridging The Gap: Nutritional Needs And Alternatives To Breastfeeding In Early Infant Development

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Abstract:

Breastfeeding (BF) and breastfeeding substitutes (BMS) play crucial roles in early infant development, with their respective nutritional benefits and limitations. This review paper presents a comprehensive overview of the significance and necessity of nutrition in early infant development, focusing on recent advancements in infant nutrition and alternatives to breast milk. The World Health Organization (WHO) and the American Academy of Paediatrics (AAP) strongly recommend exclusive breastfeeding for the first six months of life, with continued breastfeeding combined with complementary foods for at least one year and beyond. BF provides numerous health benefits for both the mother and the child, including protection against various immediate and long-term health outcomes. However, BF challenges such as physical barriers, lack of knowledge, support, and skill can lead to suboptimal BF practices. In cases where breast milk is not available, BMS serves as a crucial nutritional product for infants. BMS is classified into four main categories: infant formula, follow-on-formula, toddler milk or growing-up milk formula, and special baby milk formula. Non-medical factors, such as parents' choices and behaviours, and situational factors, such as maternal health conditions and preterm births, can influence feeding choices. Suboptimal breastfeeding causes over 800,000 under-5 child deaths annually, and early breastfeeding initiation reduces neonatal mortality by 44% among infants surviving at least 48 hours. To enable caregivers and healthcare professionals to make well-informed feeding decisions, it is essential that BMS be supported by a scientifically rigorous evidence base.

Key Words: Breastfeed, Breastmilk Substitutes, Health Benefits, Infant Development

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I. Introduction:

This review paper presents a comprehensive overview of the significance and necessity of nutrition in early infant development. It examines various aspects of Breastfeeding (BF) and Breastfeeding substitutes (BMS), elucidating their respective nutritional benefits for both mother and infant, while considering the advantages and limitations of each approach. Special focus will be placed on recent advancements in infant nutrition and alternatives to breast milk, including enhanced formula milk options and novel feeding strategies. As infancy is very decisive phase of an individual lifespan, the nutritional needs must be fulfilled to achieve good health development, immunity as well as cognitive development. Early nutritional accomplishments can lead to prevent future chronic diseases like diabetes mellitus type I, type II diabetes mellitus, obesity, cardiovascular diseases, metabolic and allergic diseases [1]. Breastfeeding is essential for the early stages of infant growth, development, and immune defence. The World Health Organization (WHO) and the American Academy of Paediatrics (AAP) strongly recommend exclusive breastfeeding for the first six months of life, with continued breastfeeding combined with complementary foods for at least one year and beyond [2]. Complementary feeding should be introduced when mother's milk is no more sufficient to achieve the nutritional requirements of the 6-23 months children [3].

II. The Importance Of Breastfeeding And Nutritional Benefits:

The breastmilk work as a protective shield for the mother and the child both. The trajectory of health sequelae of breastfed child and breastfeeding mother seems to be in positive i.e. BF is beneficial for the improvement the health. BF has been consistently shown to be protective against a large range of immediate and long-term health outcomes that are significant burden on individual, the health system and society.

1. Health Benefits for The Mother:

BF gives puff to the mother's physical, mental and emotional well-being in the entire puerperium. Whether in dropping the procured weight, dealing with the postpartum pregnancy depression, to diminish the breast cancer. BF helps in dealing with the maternal stress by reducing the cortisol and ACTH

level in hand reducing the anxiety, various other cancer like endometrial, ovarian cancer can be reduced and promotes life span of the mother, the cardiovascular diseases, type-II diabetes mellitus, alzheimer, rheumatoid arthritis, metabolic syndrome, multiple sclerosis or hypertension chances can be lessen[4],[5]. Women who breastfeed have prolonged period of postpartum anovulation than those who feed their child by infant formula[6]. Therefore, lactational amenorrhea prevents ovulation and brings power to mother to fully devote in feeding the child and along with this it also maintains the spacing between the birth which is beneficial for both child bearing mother and the infants.

2. Health Benefits for The Child:

There are ample number of evidences are available which reflect that how breastmilk plays a role as protective shield from the infancy to the adulthood. Exclusive BF during 1-6 months could save many infants because human milk is quite safe, clean and matches the infant nutritional needs. Human milk is complex fluid which contains micronutrients, macronutrients and bioactive compounds which are needed by the infants for proper growth and development[6]. Immunogenetics or immunological memory is transferred to the offspring from the mother's milk having antimicrobial properties and immune-modulatory compounds which enhance the immunity of the infant. Maternal malnutrition or reduction of nutritional supply can directly hamper the development of immune system of the offspring[7]. Neuroimaging techniques, including PET and MRI, have demonstrated that glucose uptake in the brains of neonates constitutes a substantial portion of their energy consumption. Specifically, these studies indicate that brain glucose utilization accounts for 53-60% of the total resting energy expenditure in newborns, while representing 34-40% of their overall energy usage. These findings underscore the considerable metabolic demands of the infant brain. Meta analysis shows that micronutrients like iron, zinc and iodine plays positive role in the brain development [8]. Exclusive BF is recommended until the age of 4 months and subsequently introducing various solid foods, show beneficial effect in terms of allergic, immunologic, and cardiovascular diseases, obesity and several chronic disease prevention[1].

III. Breastfeeding Challenges:

There are various reasons which hamper a proper BF routine of an infant. Some are physical barriers which lead a mother to discontinue the BF and some are taken place due the lack of knowledge, support and the skill. After either a vaginal birth or a caesarean section, it is very important to place the newborn in direct skin-to-skin contact with the mother immediately. Research shows that immediate skin-to-skin contact between mothers and newborns, along with early BF, positively influences BF success and duration. However, these practices are often delayed due to the high rate of caesarean deliveries (approximately 60%) and the associated pain and effects of anaesthesia. As a result, study participants suggested that all mothers and infants, including those who undergo C-sections, should engage in skin-to-skin contact and initiate BF as soon as possible after birth[8]. According to the most recent National Family Health Survey, although 88.6% of births in India occur in healthcare facilities, only about 42% of mothers succeed in nursing their babies within the first hour after birth (early initiation of breastfeeding)[9]. The suboptimal rate of early BF initiation represents a significant missed opportunity to provide essential nutrients and antibodies to neonates, potentially influencing their long-term health outcomes. Enhancing early BF rates could substantially reduce infant mortality and morbidity, particularly in a nation with a sizeable population such as India. Addressing the discrepancy between institutional deliveries and early BF practices could result in considerable improvements in maternal and child health on a national scale. The impediment further covers more element like the increased congestion or vascularisation, accumulation of milk which leads to oedema and also hindrance in lymphatic drainage. This all together summarized in Breast Engorgement. These sore nipples (also nipples trauma) bring pain and discomfort due to unbecoming positioning and latch on. Approximately one-quarter of women experiencing nipple infections caused by *Staphylococcus aureus* developed mastitis when not treated with systemic antibiotics. *Candida albicans*, an opportunistic pathogenic fungus, is also known to cause Candidiasis infections. Plugged ducts occur when milk from a specific area of the breast fails to drain properly, resulting in blocked lactiferous ducts. If left untreated, mastitis can progress to form a breast abscess [10], [11].

IV. Breastmilk Substitutes:

Breastmilk substitutes (BMS) are foods and beverages that are promoted to be suitable for feeding a baby during the first 6 months of life when exclusive breastfeeding is recommended. This would include juices, water, teats, feeding bottles. For infants who do not receive breast milk, BMS serves as crucial nutritional products. Due to their early developmental stage and the potential for high exposure when BMS is used as the sole nutritional source, infants are particularly vulnerable to the health effects of these substitutes. Consequently, the possible impact of BMS on public health is more significant than many other nutritional products. To enable caregivers and healthcare professionals to make well-informed feeding decisions, it is

essential that BMS be supported by a scientifically rigorous evidence base [12]. Suboptimal breastfeeding causes over 800,000 under-5 child deaths annually (11.6% of the total), including 250,000 deaths from pneumonia and diarrhoea. Research from Nepal, Ghana, and India indicates that early breastfeeding initiation reduces neonatal mortality by 44% among infants surviving at least 48 hours, particularly preventing sepsis-related deaths. Breastfeeding benefits extend beyond areas with unsafe water and high infection-related newborn mortality [13]. This is the reason why BMS should not be introduced to the baby which any prescription. Non-medical factors like parent's choices and behaviours are influenced by the information received from healthcare professionals, their peers and social network and their social-cultural tradition [14]. Situational factors like, maternal health conditions, low milk supply, preterm births & specialized formulas can lead to influence feeding choices. Alternatives of breastmilk i.e. BMS are generally classified into four main categories: Infant formula (for babies <6 months), Follow-on-formula, also known as follow-up-formula form which liquid food that provide part of the increasingly diversified weaning diet (for infant 6-11 months), Toddler milk or Growing-up milk formula (for children older than 12 months), and the last one is Special baby milk formula [15].

V. Conclusion:

This review article offers a thorough examination of the role nutrition plays in early infant growth, with a particular emphasis on breastfeeding (BF) and breastfeeding substitutes (BMS). Both the World Health Organization (WHO) and the American Academy of Paediatrics (AAP) advocate for exclusive breastfeeding during the initial six months of an infant's life, followed by a combination of breastfeeding and complementary foods for at least one year. BF provides numerous advantages for both mothers and infants, including safeguarding against various immediate and long-term health issues. Healthcare Professionals prescribe breastmilk as a prime source for healthy baby growth at all time; nevertheless, obstacles to BF such as physical impediments, insufficient knowledge, support, and expertise can result in subpar BF practices. When breast milk is unavailable, BMS serves as a vital nutritional alternative for infants. BMS is divided into four primary categories: infant formula, follow-on-formula, toddler milk or growing-up milk formula, and special baby milk formula. Both non-medical and situational factors can impact feeding choices. Inadequate breastfeeding is responsible for more than 800,000 deaths annually in children under 5, while initiating breastfeeding early reduces neonatal mortality by 44% among infants who survive for at least 48 hours. To facilitate well-informed feeding decisions, BMS must be backed by scientifically rigorous evidence.

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