



The Importance of Nutrition in Infancy: A Review

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AFSJ/2020/v18i330221

Editor(s):

(1) Dr. Uttara Singh, Panjab University, India.

Reviewers:

(1) Luiz Antonio Del Ciampo, University of São Paulo, Brazil.

(2) Sandra Hipólito Cavalcanti, Brazil.

(3) Faith Ndungi, Egerton University, Kenya.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/56538>

Received 01 March 2020

Accepted 03 May 2020

Published 19 October 2020

Review Article

ABSTRACT

Nutrition has been linked to positive child development and nutritional status. In this review paper we briefly describe the role of exclusive breastfeeding and its importance in the brain development of infants. Breastfeeding has important for the development of central nervous system in infants. First, six months of Breastfeeding is essential for the newborn child for improving the immune system of a newborn. Breastfeeding serves significant health benefits for the infant, promotes mother-infant bonding so Exclusive breastfeeding is recommended for around six months. Then we briefly describe the role of Complementary feeding, its importance in the physical development of the child in earlier life. This is also termed as 'weaning food', which has been used to describe the curtailment of breastfeeding. Complementary feeding entails the addition of solid foods to the diet, alongside, without replacement for the milk component. Apart from nutrition and feeding practices, certain other rearing practices also influence the health of infants and are widely prevalent among families or communities. Familiarity with rearing practices is of considerable significance to the promotion of infant health. The review also focuses on good nutrition for breastfeeding women, who have additional nutritional requirements. Breastfeeding mothers have increased energy needs and typically require additional energy intake. Apart from the energy the additional intake of good fat and vitamin C and minerals essential fatty acids etc. requirements are increases.

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Keywords: Nutrition; breastfeeding; weaning and newborn.

1. INTRODUCTION

In this review paper, we present an overview of much research on infant development relative to nutrition on infancy and early childhood. First, we briefly describe the importance of breastfeeding and exclusive breastfeeding for the healthy development of the child. Then we focus on complementary feeding and nutritional needs with physical and brain development. Next, we describe major nutrients as they impact infant development. Three overarching points are emphasized throughout. Throughout during the first year of life, the physical growth evolves, mouth, tongue, and digestive tract become matures and this promotes an infant suckling skill, swallowing, ingest, digest process and infant can take liquid food such as breast milk or infant formula, the child can able to chew and receive a wide variety of complementary foods. As infants mature, their food and feeding practices must continually be changed. To achieve proper growth and development, an infant must obtain an adequate amount of essential nutrients by consuming appropriate quantities and types of foods. During infancy, a period of rapid growth, nutrient requirements per pound of body weight are proportionally higher than at any other time in the life cycle.

World Health Organization [1] defines complementary feeding as “a process starting when breast milk alone is no longer sufficient to meet the nutritional requirements of infants, and therefore other nutrient-dense foods and liquids are required, along with the breast milk”. To provide infants with additional nutrients, complementary foods (foods other than breast milk or infant formula) should consequently be introduced to the infants (United States Department of Agriculture, [2]). In several parts of the developing world, complementary feeding continues as a challenge to good nutrition in children of 6–23 months [3].

In India, for instance, 54.5% of children between the ages of 6 and 8 months had received any complementary foods in the previous day, but only 7% of breastfed children between the ages of 6 and 23 months met the minimum acceptable diet apart from mother's milk. One of the research study Healthy full-term formula-fed infants (n=32) were enrolled at ≤14 days of age and exclusively fed study formulas from

enrollment, to the age of four months. Powdered study formulas were provided in a one serving capsules that were reconstituted using a dedicated automated preparation system, to ensure precise and hygienic preparation. The infant study investigating the growth and safety of infants fed with age-based formulas, with evolving compositions that mirror human milk composition over the course of lactation. The findings of this research study not only show that this stage-based infant formula system is safe and well-tolerated but also demonstrate that infants fed with the stage-based infant nutrition system grow in agreement with the WHO growth standards and manifest a healthy early weight gain pattern [4].

2. IMPORTANCE OF BREASTFEEDING AND EXCLUSIVE BREASTFEEDING

First six months Breastfeeding is essential for the newborn child for improving the immunity and brain development. So the Exclusive breastfeeding is recommended for around six months. Breastfeeding should be continued until at least 12 months of age with the complementary feed. It is important to note that feeding with expressed breast milk is both practical and safe, provided the expressed milk is appropriately stored to prevent the risk of bacterial growth [5]. Breast Milk Provides Nutrition for Babies. The benefits of breastfeeding are protecting infants from illnesses and disease. Breastfed babies have a low risk of infections, allergies, and dental caries. Breast milk contains antibodies in a sufficient amount which is essential to protect against bacterial and viral diseases. They also benefit from appropriate jaw and teeth development. This means that people who were artificially fed may experience more trips to doctors and dentists [6]. Another vital aspect of Breastfeeding is to protect the infant against life-threatening illnesses. It provides natural immunity to the infant and helps it safeguard against numerous diseases lifelong with the formation of antibodies. Breastfeeding protects against painful ear infections, upper, lowers respiratory ailments, allergies, intestinal disorders like diarrhea, colds, viral diseases, staph, e coli infections, infantile diabetes, many childhood cancers, meningitis, pneumonia, urinary tract infections, salmonella, Sudden Infant Death Syndrome (SIDS) as well as lifetime protection from Crohn's Disease, ulcerative colitis infections [7].

2.1 Important Nutrients for Infants

The following sections include information on the food sources, functions and concerns regarding major nutrients and nutrients considered to be of public health significance to infants.

3. ENERGY REQUIREMENT

Infants have a limited gastric capacity and an energy requirement per kg body weight about three times as high as adults. Carbohydrate plays an important part in infant nutrition and development. Carbohydrate spare proteins to be completely utilized for muscle growth and tissue repair processes. Less than 6 months of energy requirement 110–120 kcal/kg/day and 1-year infant needs 100 kcal/kg/day. Energy derived from mature human milk, carbohydrate calculated as lactose and 0.2% mineral constituents expressed as ash. Its energy content is 60-75 kcal/100 ml. 3- 5% protein, 6.9-7.2%, fat, 0.8%- 0.9% [8].

4. CARBOHYDRATES

In young infants, minimum carbohydrate mainly lactose intake should be 40% of total energy, gradually increasing to 55% energy by the age of 2 years. Starch is likely to be a major component of different types of complementary foods for older infants (1-2 years) and young children (more than 6 months). To ensure that its energy value is realized, this starch should be provided in a readily digestible form. In complementary foods for infants and young children, the amount of total carbohydrate shall not more than 10 g/100 ml for vegetable juices and drinks based on them, 15 g/100 ml for fruit juices, nectars and drinks based on them, 20 g/100 g for fruit-only dishes, 25 g/100 g for desserts and puddings and 5 g/100 g for other non-milk-based drinks. Increasing the intake of dietary fibers increases stool bulk, causes flatulence, and decreases appetite. Infants consume a very amount of dietary fiber, even though oligosaccharides present in breast milk which have fiber-like properties. Fibers should be introduced gradually into their complementary diet after the age of 6 months. The use of large quantities of whole-grain cereals and pulses or nuts during infancy is not recommended as they are likely to affect the bioavailability of micronutrients and result in a low-energy diet [9].

5. PROTEIN REQUIREMENT

The protein requirement of infants and young children increases with age. The amount of

protein required to satisfy their daily nutritional requirement is 9.1 gm for 6–8 months, 9.6 gm for 9–11 months and 10.9 g for 12–23 months. Breast milk provides a significant portion of the daily protein requirement of infants and young children. When average breast-milk intake is assumed, the amount of protein needed from complementary foods is 1.9 g/day at 6–8 months (21%), 4.0 g/day at 9–11 months (42%) and 6.2 g/day (57%) at 12–23 months [10,1]. Protein is an important building material in nutrient composition in complementary foods. They are significant sources of essential amino acids and energy at times of energy deprivation. An adequate supply of dietary protein is vital for maintaining cellular function and integrity and for ensuring normalcy of health and growth. On the other hand, the combined effect of protein deficiency and low energy intake leads to protein-energy malnutrition, the commonest form of malnutrition worldwide [11].

6. FATS, LIPIDS REQUIREMENT

Dietary fats constitute a significant portion of nutrients obtained from foods. For infants and young children, they are a source of energy, essential fatty acids, and fat-soluble vitamins (A, D, E and K). Also, dietary fats have an important role in promoting good health and enhancing the sensory qualities of the foods [11]. Fat accounts for about 50% of breast milk's energy and serves as the primary energy source for infants during the first 6 months of life. With the introduction of complementary food, however, fat is gradually overtaken by carbohydrates as the chief energy source. Even so, fat remains an important source of energy, and together with carbohydrates, they meet the energy needs of the growing child [12]. For those with low breast milk intake, complementary foods should provide dietary fats suitable to 34, 38 and 42% of total energy requirements for 6–8, 9–11 and 12–23 months, respectively. With adequate breast milk intake, complementary foods should provide dietary fats suitable to 34, 38 and 42% of total energy requirements for 6–8, 9–11 and 12–23 months, respectively [1].

7. MICRONUTRIENTS

Micronutrients are essential for growth, development and prevention of illness in young children. Adequate intakes of micronutrients, such as iron, zinc and calcium are important for ensuring optimal health, growth and development of infants and young children [9,11].

Breast milk makes a substantial contribution to total nutrient intake. In well-nourished mothers, breast milk contains generous amounts of vitamin A, B, C, folate, iodine and selenium. As a result, the amount needed from complementary foods before 12 months is 0 (or near to 0) [10,13]. However, breast milk is comparatively less in several other micronutrients, even after accounting for bioavailability. The percentage of total daily requirements for micronutrients needed from complementary foods ranges from 30 to 97%. For instance, 97% of iron, 86% of zinc, 81% of phosphorus, 76% of magnesium, 73% of sodium and 72% of calcium during 9–11 months are expected from complementary foods [10,1,13]. Thus, added to the fact that infants bear the only limited gastric capacity to consume an adequate quantity of food, the diets need to have very high nutrient density.

8. REARING PRACTICES OF INFANTS IN INDIA

Non-exclusive breastfeeding which includes prelacteal feeding is an important cause of infant morbidities. The other contributory factors for infection are improper and inadequate weaning foods and unhygienic feeding practices like bottle feeding as reported by the International Code of Breast Milk Substitute [14].

A study was done to analyze breastfeeding was identified as the single most effective preventive intervention, which could prevent 13-16% of all childhood deaths in India. Adequate complementary feeding between the age of 6 and 24 months could prevent an additional 6% of all such deaths [15]. Inadequate complementary food and faulty practices of feeding newborns and children also result in under nutrition as reflected by their anthropometric measurements. Under nutrition leads to poor immunity in early life and it can cause more prone to infections. This is our country is also coupled with exposure to a contaminated environment.

Therefore poor complementary feeding practices mean that many children continue to be vulnerable to irreversible outcomes of stunting, poor cognitive development and significantly increased risk of infectious diseases such as diarrhea and acute respiratory infection [16,17,18].

9. CONCLUSION

Throughout the deliberation of this review, we can understand that the quantity and quality of

feeding practices support the growth and promote the health of infants. Exclusive Breastfeeding in first six month is crucial for improving the immunity and cognitive development. As the age of the infant increases time, the requirement cannot be fulfilled by breastfeeding only so complimentary food also recommended with breastfeeding until one year. There are some other guidelines provided by WHO for breastfeeding and complementary feeding. Apart from the feeding practices we also focus on the nutritional need of infants that leads to direct impact on the growth and development of the baby.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. World Health Organization. Guiding principles for complementary feeding of the breastfed child; 2001.
2. United States Department of Agriculture (USDA). Complementary feeding. In: U. S. (USDA), Editor. Infant Nutrition and Feeding. Washington, DC: United States Department of Agriculture. 2009;101–28.
3. World Health Organization/United Nations Children's Fund. Complementary feeding of young children in developing countries: A review of current scientific knowledge; 1998.
4. Johannes Spalinger, Andreas Nydegger, Dominique Belli, Raoul I. Furlano, Jian Yan, Jerome Tanguy, Sophie Pecquet, Frédéric Destailats, Delphine Egli, Philippe Steenhout. Growth of infants fed formula with evolving nutrition composition: A single-arm non-inferiority study. *Nutrients*. 2017;9(219):2-13.
5. Department of Health Victoria. Better health channel. Breast milk – expressing. *Fertil Steril*. 2011;95:1700–04. Available:http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/Bottle_feeding_with_expressed_breast_milk_following_assisted_reproductive_technology
6. Leite-Cavalcanti A, Leite-Cavalcanti, Medeiros-Bezerra, Moura. *Rev Salud Publica*. 2007;9(2):194-204. Page DC. *Funct Orthod*. 2001;18(3):24-27.
7. Ivengar SR, Walker WA. *J Pediatr Gastroenterol Nutr.*; 2012.

8. Jenness R. The composition of human milk. *Seminars in Perinatology*. 1979;3(3): 225-39.
9. Caballero B, Allen L, Prentice A. *Encyclopedia of human nutrition*. 2nd Ed. Oxford: Elsevier; 2005.
10. Dewey KG. Nutrition, growth and complementary feeding of the breastfed infant. *Pediatr Clin North Am*. 2001;48(18): 7-104.
11. Rolfes SR, Pinna K, Whitney E. *Understanding normal and clinical nutrition*. 8th Ed Canada: Wadsworth Cengage Learning; 2008.
12. Monte CM, Giugliani ER. Recommendations for the complementary feeding of the breastfed child. *J Pediatr Rio J*. 2004;80:131-41.
13. Dewey KG, Brown KH. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food Nutr Bull*. 2003;24(1):5-28.
14. WHO. International code of marketing breast milk substitutes. 1981;6.
15. Gupta A, Rohde EJ. Infant and young child undernutrition. Where lie the solutions? *Econ Polit Wkly*. 2004;12:5213-7.
16. Saha KK, Frongillo EA, Alam DS, Arifeen SE, Persson LA, Rasmussen KM. Appropriate infant feeding practices result in better growth of infants and young children in Rural Bangladesh. *Am J Clin Nutr*. 2008;87:1852-9.
17. World Health Organization. Complementary feeding of young children in developing countries: A review of current scientific knowledge. 1998;237.
18. Hop LT, Gross R, Giay T, Sastroamidjojo S, Schultink W, Lang NT. Premature complementary feeding is associated with poorer growth of Vietnamese children. *J. Nutr*. 2000;130:2683-90.

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Peer-review history:

*The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/56538>*