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# Healthy nutrition for a healthy child: A review on infant feeding in India

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## Abstract:

Appropriate infant feeding is crucial for the improvement of child survival worldwide. This review aimed to explore the recommended practices, advantages of breastfeeding, and age-appropriate complementary feeding practices. Colostrum, which serves as the first immunization for the newborn, is largely ignored owing to the various myths surrounding it in developing countries. The World Health Organization recommends an early initiation of breastfeeding within one hour of birth and exclusive breastfeeding for 6 months to combat killer diseases such as diarrheal diseases, pneumonia, and obesity. On the other hand, complementary feeding is recommended with increase in the diversity, quantity, consistency and frequency as the child gets older along with continued breastfeeding for 12 months. Inappropriate complementary feeding is one of the major causes of malnutrition in children under the age of 5 years. Hence, appropriate guidance should be given to caregivers and health-care workers to help them promote the healthy growth of infants and young children.

## Keywords:

Colostrum, complementary feeding, exclusive breastfeeding, fortifications, infant food regulations

## Introduction

The first 1000 days of life is considered the critical window for growth and development of children. The World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) have put emphasis on this formative period, i.e., 270 days in the uterus and first 2 years after birth as an optimal period for adequate physical, mental, and cognitive growth and development of the children.<sup>[1]</sup> It is necessary to provide appropriate guidelines and guidance to the health-care providers and caretakers to improve the survival of infants and young children. These interventions not only reduce considerable morbidity and mortality at this age but also engender a healthy community, thereby paving the way for the future economic development of the country. The purpose of this review

was to discuss the various aspects of infant feeding practices in developing countries with special reference to India.

## Data Extraction

The data were extracted from PubMed, Web of Science, Google Scholar, and Lancet databases and websites such as WHO, UNICEF, and Ministry of Health and Family Welfare, Government of India. The extracted information included statistics from developing countries including India, mortality risk in childhood, practices of breastfeeding and complementary feeding, recommendation, and policies on breastfeeding and complementary feeding practices.

## Colostrum-First Food First

The WHO universally recommends colostrum, as the perfect food for every newborn. The sticky, yellowish substance produced by the mother at parturition

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which lasts from the first 2–4 days is rich in lactalbumin and lactoprotein.<sup>[2]</sup> Colostrum, to be started within the 1<sup>st</sup> h of birth, is rich in immunoglobulins (Igs) such as IgA, IgG, IgG2, and IgM antibodies, antimicrobial peptides such as lactoferrin and lactoperoxidase, growth factors such as epidermal growth factor, transforming growth factor (TGF- $\alpha$ ), TGF $\beta$ , insulin-like growth factor, and vascular endothelial growth factors, and growth hormone which not only provide immunity but also foster the growth and development of the newborn.<sup>[3]</sup>

Immediate skin-to-skin contact of the mother and baby immediately after the birth keeps the baby appropriately warm, induces the release of maternal oxytocin, and ensures that the baby receives colostrum during the first feeds.<sup>[2]</sup> The growth factors and Vitamin A in colostrum help the infant's intestine to mature and stimulate bowel movement to clear it of meconium and reduce infection. Colostrum as nutraceuticals is used in the wide variety of gastrointestinal conditions and infection and immune deficiency-related disorders.<sup>[3,4]</sup>

There is no universal indicator to measure the prevalence of colostrum feeding like other indicators of infant and young child feeding practices.<sup>[5]</sup> According to the global infant and young child feeding database from the UNICEF, the prevalence of colostrum varies among developing countries – Afghanistan (40.8%), Albania (29.8%), Algeria (35.7%), Bangladesh (35.6%), Central African Republic (43.4%), Congo (23.8%), Ethiopia (66.1%), Ghana (25.3%), India (41.4%), and Indonesia (49.3%).<sup>[6]</sup> In India, the prevalence of colostrum feeding ranges from 21% to 41% across the different states.<sup>[7-9]</sup> The prevalence of colostrum feeding is erratic and varies in different regions owing to the cultural factors of those geographical areas.

In a worldwide lack of awareness, cultural factors, the introduction of prelacteal feeding, delayed initiation of breastfeeding because of maternal illness, and cesarean section were found to be a common barrier to colostrum feeding.<sup>[10,11]</sup> The qualitative studies conducted in India reported that such taboos include the belief that colostrum is “cursed milk” or “a bad omen” creates delays in breastfeeding for about 3 days until the mother is supposedly “pure” after a ritual bath, when colostrum is discarded and buried to protect the mother from evil eyes. Prelacteal feeds such as undiluted milk, sacred water, or honey given on the 1<sup>st</sup> day of birth prevent mothers from giving colostrum.<sup>[12]</sup> The feeding and rearing practices of children, especially infants in developing countries, are rooted in cultural beliefs. Therefore, stronger political and policy commitments are required to eradicate this interference of cultural practices.

## Exclusive Breastfeeding

Exclusive breastfeeding is defined as the practice of giving only breast milk for the first 6 months of life (no other foods or water). Exclusive breastfeeding meets all the nutritional needs of infants if the breastfeeding technique is followed appropriately. It is an integral part of optimal infant and young child feeding practice, which also includes the early initiation of breastfeeding within 1 h of birth and continued breastfeeding for up to 2 years.<sup>[13]</sup>

The WHO expert committee suggests that an infant who was exclusively breastfed for 6 months has a reduced risk of developing atopic dermatitis, acute otitis media, gastrointestinal infections, lower respiratory tract infections, asthma, cognitive impairment, cardiovascular diseases, diabetes mellitus, and childhood leukemia compared to an infant who is suboptimally breastfed.<sup>[13]</sup> Furthermore, it helps to drive global nutritional target diseases, such as stunting, anemia in the reproductive age group, low birth weight, childhood overweight, and wasting.<sup>[14,15]</sup> Breastfeeding continued beyond 1 year of age provides essential fatty acids which are mostly not supplemented by complementary foods but essential for precarotenoid synthesis for Vitamin A.<sup>[16]</sup> Advantages to mothers who exclusively breastfeed their infants include regaining their prepregnancy weight and delayed conception.<sup>[17]</sup>

Since the last decade, the rate of exclusive breastfeeding has increased globally by 2.4%/year.<sup>[17]</sup> About 38% of infants aged 0–6 months are exclusively breastfed, and suboptimal breastfeeding leads to 11.6% mortality in infants and young children.<sup>[18]</sup> Globally, 47 countries, especially in Southern Asia and Eastern and Southern Africa, have achieved the targeted rates of exclusive breastfeeding, whereas in low- and middle-income countries such as Angola, Bhutan, Central African Republic, Congo, Gambia, Kazakhstan, Pakistan, and Sudan, the rate is low but rising remaining at 30% over the last 15 years.<sup>[6]</sup> The trend of exclusive breastfeeding for 6 months in India has increased from 46% in 2005–2006 to 55% in 2015–2016.<sup>[19]</sup> According to the National Health and Family Survey 2015–2016, the exclusive breastfeeding rates vary in different states of India – Chhattisgarh (77.2%), Manipur (73.6%), and Tamil Nadu (48.3%).<sup>[20]</sup>

Larger working women, women of poorer and lower economic strata, women with maternity leave of <3 months, and women working in the unorganized sector are found to be a hindrance in sustaining achievable rates in breastfeeding in the states of India. Other obstacles are the lack of awareness on exclusive breastfeeding (EBF) and appropriate breastfeeding techniques, hospital

practices not in line of breastfeeding policies, lack of adequate skills of health workers, promotion of infant formula feeding and the lack of legislation in support of breastfeeding policies. This indicates that breastfeeding is not the responsibility of the mother only but also requires the support of the family, the broader community, and the political structure.<sup>[21,22]</sup>

### Community-Based Strategies

Extending EBF for 6 months after discharge from health care requires a strong community-level commitment involving family members, community health workers, and communication channels.<sup>[22]</sup> Choosing appropriate communication channels, peer to peer or group counseling, and behavioral change communications through mass-media campaigns has a better outcome in developing countries.<sup>[23]</sup> Capacity building of community health workers on breastfeeding through Mothers' Absolute Affection is the appraising initiative taken by India for the promotion and support of breastfeeding at the community level. The program is implemented by health workers at the root level through mothers' meetings, lactation support, and interpersonal communications.<sup>[24]</sup> Tamil Nadu is a pioneer in the states of India in introducing air-conditioned breastfeeding rooms in public places to aid nursing mothers.

### Health Facility-Based Support

Advocating 10 steps of Baby-Friendly Hospital Initiative (BFHI) has proved highly successful in encouraging proper infant feeding practices starting at birth. It is necessary to set standards in antenatal care, immunization clinics, and sick baby clinic to monitor appropriate infant feeding for up to 2 years. In-service training of health-care workers, frontline workers, and supervisions is also essential in strengthening breastfeeding at health institutions and the community level.<sup>[25]</sup>

### Sensitization by Health-care Providers before Discharge from Hospital

The breastfeeding process is started right from the hospital where the message conveyed to the mother should be appropriate and acceptable. There should be appropriate sensitization of health-care workers of hospital and community such as Auxiliary Nurse Midwife, Accredited Social Health Activist, Anganwadi workers, nurses, and doctors for lactation support and management at the facilities.<sup>[22]</sup> In India, the sensitization should not focus only on nursing mothers but also directed at family members and village leaders who are the decision-makers in infant feeding. The strategies should focus on linking older women groups or dhais

(traditional birth attendant) to BFHI.<sup>[24,25]</sup> Since practicing exclusive breastfeeding for 6 months is a daily and long-term challenge, various strategies should be used to sustain encouragement at the household and community levels. In countries such as Bolivia, Ghana, and Madagascar, programs for behavioral change at the community level are in place. Breastfeeding promotion by peer counseling through PROMISE-EBF strategies in sub-Saharan African region and home-based peer counseling in Mexico are proven strategies for the improvement of breastfeeding at the community level.<sup>[26]</sup>

### Empowering Legislation

Reviews suggest that a longer maternity leave has a positive effect on exclusive breastfeeding, and this advantage is restricted to mothers who work in the informal sectors.<sup>[27]</sup> Strict enforcement of legislation on aggressive marketing on breast milk substitutes and infant milk substitutes, feeding bottles, and teats should be advocated to ensure safe, proper, and protected breastfeeding substitutes.<sup>[28]</sup> Countries like Sri Lanka and Malawi have a strong and enforced legislation on the marketing of breast milk substitution, which is reflected in their higher rate of exclusive breastfeeding.<sup>[29]</sup>

### Improving Awareness

World breastfeeding week (WBW) is celebrated every year from 1 to 7 August by the WHO, UNICEF, World Alliance for Breastfeeding Alliance (WABA), and government policymakers to protect, promote, support breastfeeding and join hands with health centers and hospitals to encourage all mothers to adopt appropriate breastfeeding practices. Interactive sessions with mothers, sensitization programs for undergraduates and postgraduates on breastfeeding, symposiums, exhibitions, and outreach programs on breastfeeding all over India to emphasize the importance of breastfeeding take place.<sup>[30]</sup> Hospitals and medical colleges have been rewarded by WABA for their outstanding performance on breastfeeding promotion every year.<sup>[31]</sup> Similarly, the national nutritional program, Cambodia, extended WBW from August 1 to September 5, 2018, for capacity building workshop for nongovernmental organizations (NGOs) and government officers from operation districts and provincial health departments and staff from 20 different NGOs working in health, nutrition, maternity, and child health sectors in Cambodia. The Indonesian government commemorated WBW for an entire month and promoted breastfeeding on television channels from the end of July to mid-August. The Pakistan Scaling Up Nutrition Civil Society Alliance envisages vibrant social media campaign and interactive session with families and communities and women's peer groups to promote breastfeeding.<sup>[32]</sup>

## Complementary Feeding

In addition to breastfeeding, to meet the nutritional needs of the infant, complementary foods are added to the diet of the child. The transition from exclusive breastfeeding to family foods, referred to as complementary feeding, typically covers the period from 6 to 24 months of age, a very vulnerable period prone to malnutrition.<sup>[33]</sup> Apart from energy requirement, certain micronutrients such as iron, zinc, and Vitamin A which are reduced in breastfeeding before 6 months should be supplemented in complementary feeding.<sup>[17,34]</sup> Timely introduction of complementary feeding at 6–8 months is crucial. Early weaning leads to an increased risk of type 1 diabetes, obesity, celiac disease, and eczema, and late weaning after 8 months leads to deficiency of zinc, protein, iron, and Vitamins B and D.<sup>[34]</sup> In India, the current prevalence of children receiving complementary feeding at 6–8 months is 42.7%.<sup>[20]</sup> Studies from various regions of the country suggest that the age of weaning varies in different areas of India. In Kolkata, the weaning of 32% of children aged from 6 to 23 months began before they were 6 months old and, for 32%, it was initiated after 8 months, and only 36% of the children were started on complementary feeding at the correct age of 6 months.<sup>[35]</sup> In Delhi, 72% of children at the age of 6–8 months were weaned at 6–8 months, which was higher than the national family survey data.<sup>[36]</sup> In a study, about 62% of the mothers in Tamil Nadu introduced complementary foods to their infants before 5 months, while for 36%, complementary feeding was introduced at 6 months.<sup>[37]</sup> In West Bengal, 27.3% of children had complementary feeding before they were 6 months old, and only 28% of children had complementary foods at 6–7 months and 44.8% after 7 months–1 year.<sup>[38]</sup> The prevalence of age of weaning varies with countries. In Bangladesh, 78% of children are weaned before 6 months of age, and only 15% of children are weaned after 6–7 months.<sup>[39]</sup> In new Belgium, 62% of children were weaned before they were 6 months old, and 15% of children were not weaned till they were 23 months. About 15% of Nigerian mothers introduced complementary feeding before 4 months and 44.5% between 4 to 6 months and only 40.5% of mothers introduced after 6 months of delivery.<sup>[40]</sup> In Saudi Arabia, 62.5% of infants were given complementary foods before reaching 6 months of age.<sup>[41]</sup>

## Nutritional Need for Infants

A healthy, average breastfed infant requires approximate energy of 200 Kcal, 300 Kcal, and 550 Kcal at 6–8 months, 9–11 months, and 12–23 months, respectively. This amount of energy is required for the optimal growth and development of cognitive functions of the infant. The caregivers may not know the amount and measure of breastfeeding given and the complementary feed

necessary to meet the above requirement. Therefore, what is required is responsive feeding including feeding on cues and hunger, encouraging children to eat and ensuring reduced distractions while feeding. An ideal complementary food has to supply the required 97% of iron, 86% zinc, 81% phosphorus, 76% magnesium, 73% sodium, and 72% calcium. The diet containing relatively small and less dense complementary feed during 6–24 months leads to both macro- and micronutrient deficiencies in later life.<sup>[17]</sup> In India, complementary foods are predominantly plant based which potentially lack some key nutrients that could be supplied by the addition of meat, poultry, fish, milk, and Vitamin A-rich fruits to prevent other micronutritional deficiencies.<sup>[42]</sup> There is a worldwide debate about optimal requirement of fat considering the risk of too little and excessive intake of fats for infants. For an infant in developing countries, consuming an average amount of breast milk with normal fat concentration (38 g/L) requires 0%–34% at 6–8 months, 5%–38% at 9–11 months, and 17%–42% at 12–23 months' percentage of energy from fat in complementary foods.<sup>[43]</sup>

## Myths and Practices in Complementary Feeding in India

The practice and pattern of feeding in the first 2 years of life is an important determinant of malnourishment in India. Ultimately, maternal decision determines how an infant and young child are fed which in turn determined by the family and community she belongs. Review of studies explored a number of myths surrounding complementary feeding such as the avoidance of cereals and pulses because they are considered difficult for the infant to digest. Undiluted milk is avoided, so are fresh juices, milk, and sugar as they are thought to produce worms in the stomach; jaggery, eggs, mangoes, and spicy foods are thought to be hot foods. The common belief for late weaning is that infants are too young to digest foods and therefore tend to vomit, which is considered potentially harmful.<sup>[44]</sup> Since myths and beliefs on infant and young child feeding practices are currently so deep-rooted in countries such as India, community awareness and sensitization are required to deal with these issues and achieve optimum feeding.

## Balanced Diet for Infant and Young Children

The development of uniform guidelines for complementary feeding is not feasible because of the varying feeding practices in different geographical and cultural areas in developing countries. Therefore, population-based specific dietary guidelines for particular areas are developed to meet the nutritional

needs of growing infants.<sup>[17]</sup> It is recommended that in a day, children aged 6–24 months should have a minimum of at least four out of seven locally available food groups such as dairy products, cereals, tubers, legumes and nuts, flesh foods, eggs, Vitamin A-rich fruits, and vegetables. The minimum meal frequency should be increased with increasing age of the child. For the average healthy breastfed infant, meals of complementary foods should be provided 2–3 times/day at 6–8 months of age and 3–4 times/day at 9–11 and 12–24 months of age, with additional nutritious snacks (such as a piece of fruit or bread or chapatti with nut paste) offered 1–2 times/day, as desired.<sup>[17]</sup> The feeding also depends on the energy density of the local foods and the amounts consumed at each feeding. The minimum diet diversity and meal frequency should meet the energy and other micronutrients required by the infants to grow healthily.<sup>[45]</sup>

### Clean and Safe Food

Hygienic practices during food preparation and feeding are important in the prevention and control of gastrointestinal disease in children.<sup>[46]</sup> Simple hygiene like hand washing before preparation and feeding, safe storage of foods and feeding directly after preparation, using clean utensils for cooking children's food, avoiding bottle feeding, and encouraging family food as complementary feeding are crucial.<sup>[26]</sup> Studies suggest that the peak prevalence of diarrhea is in the second half year of life and is associated with the bottle nipples contaminated with *Escherichia coli*.<sup>[47]</sup>

### Regulations on Infant and Complementary Feeding

Reviews emphasize that commercially available infant and complementary feeding has reduced the duration of exclusive breastfeeding and replaced home-based complementary feeding. Countries, where commercial foods are easily available, have early weaning practices.<sup>[48]</sup> However, nutritionally balanced commercial foods, if affordable, could be better than poor-quality complementary food prepared at home.<sup>[48]</sup> Strict rules and regulations for marketing such commercial foods need to be implemented to avert the risks certain foods pose for the growth of young children. The Food Safety and Standards Authority of India in 2017 proposed the regulation of foods for infant nutrition. These included amendments to the contents, labeling, microbiological standards, standards on vitamins, micronutrients, and fatty acid contents, Bureau of Indian Standards certification, additives such as emulsifiers, and acidity in infant foods to standardize baby foods sold in the country.<sup>[49]</sup>

### Fortification of Complementary Food Products

In India, complementary foods are predominantly plant based. Animal foods consumed by infants do not adequately fill the micronutrient requirements of iron, zinc, and calcium. Reviews from developing countries suggest that complementary foods including animal foods do not satisfactorily achieve the desired level of micronutrients. Unlike developed countries, complementary foods are not always fortified with iron and zinc in developing countries. The fortification of foods with micronutrients and vitamin supplementation for mothers do not only ensure their health but also ensure the maintenance of adequate concentrations in breast milk.<sup>[24]</sup> In India, wheat flour fortified with iron and folic acid, multigrain flour supplementation fortified with iron, vegetable oils with Vitamin A, and milk fortified with Vitamin D are long-term strategies being used to combat micronutrient deficiencies.<sup>[50]</sup>

### Conclusion

Optimal infant and young child feeding practice is the most effective intervention for child survival. Although infant and young child feeding practices have been adhered to for more than a decade, globally not much progress has been made except in exclusive breastfeeding. To improve this situation, mothers and families should be actively involved in promoting and supporting infant feeding. Infant and young child feeding practice is not well addressed in the circles of health-care professionals because of the lack of skills to assist the mothers and the absence of knowledge of the scientific rationale behind age-appropriate feeding. Special attention should be paid to short- and long-term nutritional policies for infant and young children feeding practices.

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