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FORMULA FEEDING: SUBSTITUTE OF BREAST FEEDING—A REVIEW

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Abstract:

Infant formulae are unique because they are the only source of nutrition for many infants during the first 4 to 6 months of life. They are critical to infant health since they must safely support growth and development during a period when the consequences on inadequate nutrition are most severe. Early infancy represents a period of growth and development when a successful outcome depends on the timely emergence of critical structures and developmental processes. The gastrointestinal, renal, and immune systems, as well as brain and neurological functions, could be affected by exposure to potentially harmful substances contained in infant formulas.

Infant formula is intended as an effective substitute to breast milk and is formulated to mimic the nutritional composition of breast milk. The recently updated FDA (Food and Drug Administration) rule on current Good Manufacturing Practices for infant formula, requires, among other things, that formulae satisfy the quality factors of normal physical growth and a sufficient biological quality of protein component (adequate amounts of protein in a form that can be used by infants). Infant formula is only for the health of infants without unusual medical or dietary problems.

Key words: Breastfeeding, Formula foods, Importance, Safety rules, Risks.

Introduction

Infant formulae are liquids or reconstituted powders fed to infants and young children to serve as substitutes for human milk. Infant formulae have a special role in the diet because they are the only source of nutrients for some infants. The vast majority of infants receive infant formula at some time during their first year of life as the number of infants' breastfed after birth rapidly decreases. Many infants receive formula in combination with breastfeeding. During these mixed feeding routines there are potential interactions between the components of human milk and those contained in formulas [1].

Over recent decades ingredients have been added to infant formulae not only to better simulate the composition of human milk, but also to impart health benefits. Examples include fortifying formulae with iron, adding

nucleotides, and changing the composition of fat blends. Recently infant formulae containing added sources of arachidonic acid and docosahexanoic acid have been made available in almost every state[1]. New ingredients, such as probiotics and compounds produced by genetic engineering, are currently being considered for addition to formulas.

Infancy is a uniquely vulnerable period of rapid growth and development and as such, feeding changes have the potential to impart benefit or harm in the short term, into early childhood, and even later into adulthood. Thus measurements of safety parameters during infancy need to be equally or even more stringent than at other periods during the life cycle.

Review of literature

Importance of human milk

Breastfeeding is the recommended feeding method for infants. The unique qualities of breastfeeding are especially important for vulnerable infants. Breast milk provides particular protection against infections, and necrotizing enterocolitis and has also been linked to enhance neurodevelopmental outcomes for these high risk infants. It has indicated that breast milk feeding has long term consequences that can positively influence cardiovascular, bone, and cognitive function in adulthood. Breastfeeding can also reduce later risk of obesity and diabetes. Despite these health outcomes, breastfeeding rates are low for infants. Nurses can play significant roles in promoting and supporting breastfeeding, despite the unique challenges facing high risk babies and mothers. Breastfeeding beliefs, knowledge, and attitudes have been related to breastfeeding support from maternal child health nurses [2].

The immune system of preterm infants is immature, placing them at increased risk for serious immune-related complications. Human milk provides a variety of immune protective and immune maturation factors that are beneficial to the preterm infant's poorly developed immune system. The most studied immune components in human milk include antimicrobial proteins, maternal leukocytes, immunoglobulins, cytokines and chemokines, oligosaccharides, gangliosides, nucleotides, and long-chain polyunsaturated fatty acids. There is growing evidence that these components contribute to the lower incidence of immune-related conditions in the preterm infant. Therefore, provision of these components in human milk, donor milk, or formula may provide immunologic benefits.

Special considerations of infant formula

Dealing with infancy makes interpretation of safety guidelines particularly difficult. Infancy is a period of very rapid development and change is the rule rather than the exception. Infants are nonverbal and cannot report their own experiences, and parents may not be able to accurately interpret the signals that infants provide. It is reasonable to expect that any harmful effects from an ingredient might be subtle. (Creswell JW. Qualitative inquiry and research design: Choosing among five traditions. Los Angeles, CA: Sage; 2013.)

At birth, infants make a dramatic transition from a highly controlled prenatal environment where oxygen and nutrients are delivered directly from the mother to infant via the blood supply, to one that involves enteral feeding and thus requires an efficient gastrointestinal system and coordination of a wide range of functions. Not all organ systems are fully mature at birth and as they undergo further development, they are highly susceptible to environmental inputs.

Early infancy represents a period of growth and development when a successful outcome depends on the timely emergence of critical structures and developmental processes. At the same time, infancy is a period of heightened vulnerability to nutritional inputs, illnesses, care practices, and other environmental influences. (Rao R, Georgieff MK. Early nutrition and brain development. In: Nelson C, editor. , ed. The Minnesota Symposia on Child Psychology. The Effects of Adversity on Neurobehavioral Development. Vol. 31. Mahway, NJ: Lawrence Erlbaum Associates. Pp.1–30. 2000.)

Immune Function

The infant immune system is not fully mature at birth; it has deficits in the ability to prevent invasion of pathogens and to respond to antigens. Of particular concern in the context of ingredients new to infant formulae is the increased permeability of the gut mucosal barrier in the presence of inflammation or infection or if the integrity of the epithelial cell layer is disrupted. The increased permeability allows macromolecules to be absorbed, which stimulates allergic responses to food proteins.

Brain and Behaviour

There is rapid development of both brain and behaviour during the first year of life. Both sub cortical and cortical central nervous system (CNS) structures mature and allow the appearance of critical developmental functions, such as visually guided reaching, face recognition and orientation toward faces, explicit and working memory, focused attention, and inhibitory control. The quality of the young infant's nutritional intake can be an important influence on CNS development and function. For example, iron deficiency anaemia in the first year interferes with the development of functional CNS processes, such as alteration in the number of dopamine receptors or degree of myelination. These functional changes in turn can have long-term cognitive and behavioural consequences that cannot be compensated for by subsequent nutritional interventions.

Amount of Formula Feedings [7]

After the first few days, formula-fed newborn will take from 60–90 ml of formula per feeding and will drink every three to four hours on average during her first few weeks. (Breastfed infants usually take smaller, more frequent feedings than formula-fed infants.)During the first month, if baby sleeps longer than four to five hours and starts missing feedings wake her up and offer a bottle.

By the end of first month, baby will be up to 120 ml per feeding, with a fairly predictable schedule of feedings about every four hours. By six months; baby will consume 180–240 ml at each of four or five feedings in twenty-four hours. On average, baby should take in about 75 ml of formula a day for 0.453 kg of body weight. But baby probably will regulate his intake from day to day to meet his own specific needs.

Risks of Formula Feeding

Formula feeding has risks that are not associated with feeding human milk to infants. It is presumably these risks that mothers using peer-to-peer shared human milk wish to avoid. Formula feeding is associated with increased risk of infectious diseases including gastrointestinal disease and respiratory tract infections. In resource-rich countries, children who are fed infant formula are up to five times more likely to be hospitalized in infancy than children who are fully breastfed [4].

Some of the mechanisms by which formula feeding might facilitate infection are understood; for example, ingestion of foreign protein such as dairy protein in infant formula

can inflame and damage the protective mucous membrane of the intestine assisting colonisation by pathogens[9,10]

The use of infant formula is also associated with an increased risk of non-infectious diseases such as allergic diseases and type 1 and 2 diabetes ;[11,12] again, the early exposure to "foreign" foods is thought to be a factor in the development of these illnesses.[13,14]

In addition, formula feeding is associated with impaired cognitive development, perhaps because infant formula lacks many ingredients thought to be involved in brain development.[15,16]

Finally, formula feeding is associated with an increased risk of death due to Sudden Infant Death Syndrome (SIDS) that is 3.7 times that of breast fed babies.

Higher risk of lung infections [16]

Children who are formula fed are 16.7 times more likely to have pneumonia than children who were given only breast milk as infants.

Increased risk of chronic diseases

- Celiac disease may be triggered by an autoimmune response when an infant is exposed to a food containing gluten proteins. Ivarsson and her team of researchers looked at the breast feeding patterns of 627 children with celiac disease and at 1254 healthy children to determine the effect of breastfeeding during the time of introduction of gluten-containing foods on the outcome of the development of celiac disease. An astounding 40% risk reduction was reported for the development of celiac disease in children at two years of age or younger for those who were breastfed when dietary gluten was introduced. The effect was even more pronounced in infants who continued to be breastfed after dietary gluten was introduced, the authors noted.[17]
- Inflammatory bowel disease and Crohn's disease are chronic gastrointestinal conditions that are more frequent for those who are formula fed. A meta-analysis on 17 relevant studies supports the hypothesis that breastfeeding is associated with lower risks of Crohn's disease and ulcerative colitis.[18]
- To determine the effect of early infant feeding practices (i.e. the impact of breastfeeding versus no breastfeeding; the duration of breastfeeding; and the effect of breastfeeding while introducing gluten containing foods) on the development of celiac disease (CD), the authors reviewed the literature available on breastfeeding and CD. They found that children with CD were breastfed for a significantly shorter period of time. Children being breastfed at the time of gluten reduction had a 52% reduction of risk for developing CD compared with children who were not breastfeeding at the time of introduction. The authors pose two potential mechanisms for the protective effect. First, that continued breastfeeding limits the actual amounts of gluten received. Secondly, that breastfeeding protects against intestinal infections. Infections can increase the permeability of the infant's gut and therefore allow the passage of gluten into the lamina propria. Others have suggested that breast milk IgA may reduce the immune response to ingested gluten or immune modulation may occur through specific T-cell suppressive effects.[19]

Increased risk of diabetes

- To determine the link between cow's milk (and cow's milk based infant formula)

consumption and the development of antibody response to cow's milk protein, Italian researchers measured the antibody response of 16 breastfed and 12 cow's milk-fed infants under 4 months of age. Cow's milk-fed infants had elevated levels of beta-casein antibodies when compared to breastfed infants. They concluded that breastfeeding for the first 4 months prevented the production of antibodies and could have a preventive effect on the development of Type 1 diabetes.[11][12]

- In this case-controlled study, 46 native Canadian Type II diabetes patients were matched with 92 controls. Pre and postnatal risk factors were compared. Breastfeeding was found to reduce the risk of Type II diabetes.[23]
- Early introduction of infant formula, solids and cow's milk are factors shown to increase the incidence of Type I diabetes later in life. Swedish (517) and Lithuanian (286) children aged 0 to 15 years who were diagnosed with Type I diabetes were compared to non-diabetic controls. The results showed that exclusive breastfeeding for 5 months and total breastfeeding for longer than 7 or 9 months are protective against diabetes.[22]
- Data was collected via questionnaires in this case-controlled study consisting of 868 diabetic Czech children and 1,466 controls. This study too confirms that the risk for type I diabetes decreases with increased duration of breastfeeding. Not breastfeeding was associated with an increased risk or of 1.93. Breastfeeding for 12 months or longer reduced the risk significantly or of 0.42.[23]

Increased risk of otitis media and ear infections

- The number of episodes of acute otitis media increased significantly with decreased duration and exclusivity of breastfeeding.US infants who were exclusively breastfed for 4 months or more had a 50% reduction of episodes compared to infants who were not breastfed. A 40% reduction of episodes was reported for breastfeeding infants who were supplemented before four months of age[24].
- Between 6 and 12 months of age the incidence of first episodes of otitis media is greater for formula-fed infants than for exclusively breastfed infants. For exclusively breastfed infants the incidence increased from 25% to 51% compared to a rise from 54% to 76% for exclusively formula fed infants. The authors concluded that breastfeeding even for a short period (three months) would significantly reduce the episodes of otitis media during infancy.[25]

Increased risk of side effects of environmental contaminants

- A Dutch study showed that at 6 years of age, cognitive development is affected by prenatal exposure to polychlorinated biphenyls (PCBs) and dioxins. An adverse effect of prenatal exposure on neurological outcome was also demonstrated in the formula-fed group but not in the breastfed group. Despite higher PCB exposures from breast milk, the study found at 18 months, 42 months of age and at 6 years of age a beneficial effect of breastfeeding on the quality of movements, in terms of fluency, and in cognitive development tests. The data gives evidence that prenatal exposure

to PCBs does have subtle negative effects on neurological and cognitive development of the child up to school age. The study also gives evidence that breastfeeding counteracts the adverse developmental effects of PCBs and dioxins.[26]

- Another Dutch study to determine the perinatal effects of exposure to polychlorinated biphenyls (PCBs), assessed breastfed and formula-fed infants at 9 years of age. By measuring auditory P300 latencies (the reaction time to incoming stimuli, which are known to be negatively impacted by PCBs) they found that those who were formula-fed or breastfed for less than 6 to 16 weeks, experienced greater latency and delayed mechanisms in the central nervous system that evaluate and process relevant stimuli. On the other hand breastfeeding accelerates these mechanisms[27].

Increased altered occlusion

- Breastfeed for straight teeth is the message from this research on feeding, sucking and dentition. This retrospective study of 1130 preschool children (3-5years of age) looked at the impact of the type of feeding and non-nutritive sucking activity on occlusion in deciduous dentition. Detailed infant feeding and non-nutritive sucking activity history was collected by questionnaire in addition to an oral examination by a dentist. Non-nutritive sucking activity has a substantial effect on altered occlusion, while the effect of bottle feeding is less marked. Posterior cross-bite was more frequent in bottle-fed children and in those with non-nutritive sucking activity. The percentage of cross-bite was lower in breastfed children with non-nutritive sucking activity (5%) than in bottle-fed children with non-nutritive sucking activity (13 %). In conclusion, the data demonstrates that non-nutritive sucking activity in the first months of life is the main risk factor for development of altered occlusion and open bite in deciduous dentition. Children with non-nutritive sucking activity and who were bottle-fed had more than double the risk of posterior cross-bite, while breastfeeding seems to have a protective effect on development of posterior cross-bite in deciduous dentition.[28]

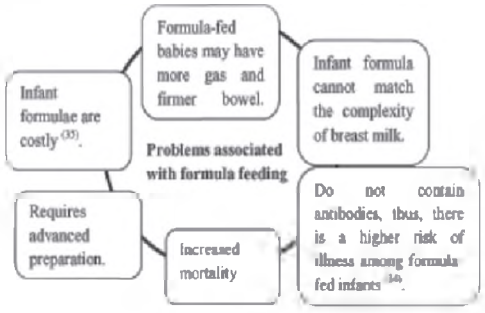
Increased risk of childhood cancers

- The UK Childhood Cancer Study analyzed 3500 childhood cancer cases and the relationship to breastfeeding. Results showed a small reduction for leukaemia and for all cancers combined when infants had "ever been breastfed."[29].
- A case controlled study in the United Arab Emirates looked at 117 cases of acute lymphocytic leukaemia and 117 controls. They found that the breastfeeding duration of those with leukaemia was significantly shorter than the breastfeeding duration of the controls. They concluded that breastfeeding duration of 6 months or longer may protect against childhood acute leukaemia and lymphomas[30].
- Lack of breastfeeding is known to increase the risk of cancer. This novel study found a significant level of genetic damage in infants aged 9 to 12 months who were not breastfed. The authors speculate that the genetic damage may play a role in the development of cancer in childhood or later life.[31]
- This systematic review to look at the evidence for the effect of breastfeeding on

the risk of developing childhood leukaemia examined 111 studies from which they identified 32 eligible articles. Of these they reviewed 10 and found that four had quality evidence regarding the association between breastfeeding and leukaemia .In the two largest and highest quality studies breastfeeding was associated with a significant risk reduction and in one of these studies, greater durations reflected greater protection.[32]

Problems associated with formula feeding

Formula feeding have some benefits such as a convenience, fewer feeding times and mothers need not worry about their food or liquid intake being passed to the baby. However, infant formulas do have drawbacks as shown in Figure 1.



Reasons for introducing solid foods:

Complementary feeding is the term used for giving other foods and drinks in addition to breastfeeding after the completion of the 6 months exclusive breastfeeding period [35]. According to WHO , this process covers the period from 6-24 months of age and is a critical period of growth during which infants are at high risk of nutrient deficiencies and illnesses.

The importance of introducing solid foods in addition to the infant's milk feed is shown in Figure 2.



National Guidelines on Infant and Young Child Feeding:

The under five years population of India stands at a staggering 112.8 million [31]. However, despite all the advances in health, education and agriculture sectors as well as vast improvements in the country's economy, India as of 2011, unfortunately figures in the list of countries that had made insufficient progress towards meeting the Millennium Development Goal [35]. It has the largest numbers of under 5 children who are moderately or severely stunted (i.e., 61,723 thousands),

accounting for 38% of the global burden. India also has the highest numbers of children with moderate and severe wasting (i.e., 25,461 thousands). An estimated 54,650 thousand children in this age group are underweight. India alone accounts for one third of the global burden of low birth weight even as 66% of infants in the country are not weighed at birth. According to National Family Health Survey-3 data, about 20 million children are not able to receive exclusive breast feeding for the first six months of life and about 13 million do not get good, timely and appropriate complementary feeding after six months along with continued breast feeding. Over the past several years, India has failed to witness any remarkable progress in infant feeding practices, with only a small increment being recorded in exclusive breastfeeding rates amongst infants 0-6 months of age, from 41.2% in 1998-99 (NFHS-2) to 46.3% in 2005–2006 (NFHS-3). As per the NFHS-3 data

57% Indian mothers offered prelacteal feeds to their newborns, and around 45% do not start breastfeeding within twenty four hours of birth. The rate of early initiation of breastfeeding (within 1 hour of birth) stands abysmally low at 24.5%, while the median duration (months) of exclusive breastfeeding among last-born children is as brief as two months. Further, the rate of exclusive breastfeeding drops progressively from 51% at 2-3 months of age to 28 % at 4-5 months of age. In a recent, largest Annual Health Survey conducted in India from 2010 to 2013 covering all the 284 districts (as per 2011 census) of 8 Empowered Action Group States like Bihar, Uttar Pradesh, Uttarakhand, Jharkhand, Madhya Pradesh, Chattisgarh, Odisha and Rajasthan (EAG States) and Assam, the percentage of children breast fed within one hour of birth was observed to vary from 30% in Bihar and Uttar Pradesh (UP) to around 70% in Assam and Odisha. Children exclusively breastfed for at least 6 months ranged from 17.7% in UP to 47.5% in Chhattisgarh. Complementary feeding is introduced in only 53% infants between 6–8 months of age, with only about 44 % of breastfed children being fed at least the minimum number of times recommended [39]. Only half of them also consume food from three or more food groups. Feeding practices are even poorer in non-breastfeeding children. Overall, only 21 percent of breastfeeding and non-breastfeeding children are fed in accordance with the infant and young child feeding recommendations. Some of the important reasons for the dismal nutrition status of our infants and young children include inadequate or inappropriate knowledge amongst caregivers regarding correct infant and young child feeding practices, frequent infections, high population pressure, low social and nutritional status of girls and women, suboptimal delivery of social services and lack of more viable infant and young child feeding guidelines.

Appropriate & Optimal Infant & Young Child Nutrition Practices

A. ***Technical Guidelines***

1. Breastfeeding
2. Complementary feeding
3. Feeding in the context of HIV infection
4. Concept and Need for Human Milk Banks in India
5. Feeding in other specific situations
6. Micronutrients in Infant Feeding
7. Junk Food and Infant Feeding
8. Maternal Nutrition

B. ***Operational Guidelines***

1. Recommendations for Governmental and International Agencies
2. Role of NGOs
3. Recommendations for the media
4. Training recommendations

A. Technical Guidelines

1. Breastfeeding

WHO/UNICEF have emphasized the first 1000 days of life that is the 270 days in utero and the first two years after birth as the critical window period for IYCN (infant and young child nutrition)

interventions. Because the maximal brain growth occurs in this period, malnutrition in this critical period can lead to stunting and suboptimal developmental outcome. Periodic feeding should be practiced only on medical advice.

2. Complementary Feeding

Appropriately thick homogenous complementary foods made from locally available foods should be introduced at six completed months to all babies while

continuing breastfeeding *ad libitum*. This should be the standard and universal practice. During this period breastfeeding should be actively supported and the term "Weaning" should be avoided [39] Complementary feeding should
be projected as the bridge that the mother has to make between liquid to solid transition and to empower the baby to 'family pot feeding'. Consistency of foods should be appropriate to the developmental readiness of the child in munching, chewing and swallowing. 'Neophobia' is the rule in them and any item may have to be offered several times for acceptance. Avoid foods which can pose choking hazard. Introduce lumpy or granular foods and most tastes by about 9 to 10 months. Missing this age may lead to feeding fussiness later. So do not use mixers/grinders to make food semisolid/pasty. The details of food including; texture, frequency and average amount are enumerated in Table - 1.

3. HIV and Infant Feeding

"The following guidelines of HIV and Infant Feeding are based on recommendations given by WHO and NACO[40]":

a. Counseling for infant feeding should begin in the antenatal period. All HIV infected pregnant women should be informed about infant feeding options, viz. exclusive breast feeding or exclusive replacement feeding. Breast feeding is the preferred choice in developing countries as it maximizes the chances of survival of the infant. The health care providers and counselors should be trained to help the pregnant women in reaching the right decision and to support them in implementing breast feeding [39].

Table - 1: Amounts of foods to offer [41]

Age	*Texture*	*Frequency*	*Avg. Amt each meal*
6-8 months	Start with thick porridge, well mashed foods	2-3 meals per day plus frequent BF	Start with 2-3 tablespoonfuls
9-11 months	Finely chopped or mashed foods, and foods that baby can pick up	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	½ of a 250 ml cup/ bowl
12-23 months	Family foods, chopped or mashed if necessary	3-4 meals plus BF. Depending on appetite offer 1-2 snacks	3/4 to one 250 ml cup/bowl
If baby is not breastfed, give in addition: 1-2 cups of milk per day, and 1-2 extra meals per day.			
The amounts of food included in the table are recommended when the energy density of the meals is about 0.8 to 1.0 Kcal/g. If the energy density of the meals is about 0.6 Kcal/g, recommend increasing the energy density of the meal (adding special foods) or increase the amount of food per meal. Find out what the energy content of complementary foods is in your setting and adapt the table accordingly.			

b. In resource-limited settings, HIV infected mothers of HIV uninfected infants often face a difficult dilemma regarding infant feeding. Breastfeeding risks transmission of HIV to their infants, however formula feeding may not be a viable option due to high cost, lack of clean water or stigma associated with not breastfeeding. The risk of HIV transmission through breast milk is greatest in the first several months of life; however, a lower but constant risk persists throughout the entire breastfeeding period. Recent clinical studies have established that HIV infected mothers can breastfeed with minimal risk of HIV transmission to their infants as long as the mother and the infant receive appropriate antiretroviral prophylaxis.

c. Breastfeeding should stop once a nutritionally adequate and safe diet without breast milk can be provided. Breast-feeding should not be stopped abruptly. Gradually wean from breast milk over a one month period.

Alternatives to breastfeeding include

For infants less than 6 months of age:

i. Expressed, heat-treated breast milk
ii. Unmodified animal milk
iii. Commercial infant formula milk.
(The choice / selection shall be based on AFASS criteria)

For children over 6 months of age:

iv. All children can be given complementary foods from six months of age (as discussed in the section on complimentary feeding).

Other options for all ages:

v. Breastfeeding by another woman who is HIV negative (wet-nursing)
vi. Human milk from breast milk banks.

Replacement Feeding (RF) is the process of feeding a child who is not receiving any breast milk, with a diet that provides all the nutrients until the child is fully fed on family foods. The replacement feeding option should be selected, only if all of the AFASS criteria are completely fulfilled. Cup feeding should be the method of choice if replacement feeding needs to be done and bottles should be totally avoided. If any of the AFASS criteria is not met, the mother should practice exclusive breast feeding till 6 months along with early treatment of breast and nipple problems.

Mixed feeding must be avoided (except the short transition period of around a month when breastfeeding is being gradually stopped) as it causes a two fold increase in the risk of postnatal HIV transmission.

4. Concept and need of Human Milk Banks in India

a. Human Milk Banks should be promoted considering the large number of babies needing PDHM (pasteurized donor human milk) when mother (Mother's own Milk) is not available. In 1980 the World Health Organization and UNICEF jointly declared: "Where it is not possible for the biological mother to breastfeed, the first alternative, if available, should be the use of human milk from other sources. Human milk banks should be made available in appropriate situations".

b. Presence of human milk bank is also a factor promoting breastfeeding.

i. Use of PDHM in NICU is associated with increased breastfeeding rate at discharge from the hospital for VLBW infants.
ii. The novel approach of promoting human milk banks through mode of collecting breast milk donations in form of camps is a strong means of promoting breastfeeding in the society.

5. Feeding in other specific situations.

a. Feeding during sickness is important for recovery and for prevention of under nutrition.

Even sick babies mostly continue to breastfeed and the infant can be encouraged to eat small quantities
of nutrient rich food but more frequently and by offering foods that the child likes to eat. After the illness the nutrient intake of child can be easily increased by increasing one or two meals in the daily diet for a period of about a month; by offering nutritious snacks between meals; by giving extra amount at each meal; and by continuing breastfeeding.

b. Infant feeding in maternal illnesses:

i. Painful and/or infective breast conditions like breast abscess and mastitis and psychiatric illnesses which pose a danger to the child's life e g. postpartum psychosis, schizophrenia may need a temporary cessation of breastfeeding. Treatment of primary condition should be done and breastfeeding started as soon as possible.

ii. Chronic infections like tuberculosis, leprosy, or medical conditions like hypothyroidism need treatment of the primary condition and don't warrant discontinuation of breastfeeding.

6. Micronutrient in Infant Feeding

a. Micronutrients enhance nutritional value of food and have profound impact on a child's development.

b. Breastmilk has usually adequate amount of Iron, Calcium, Phosphorus, Vitamin A etc for a normal newborn. Preterm infants who are breastfed should receive 2 mg of supplemental iron per kg of body weight each day by one month of age . Preterm and low birth weight may also need calcium and multivitamin supplements.

c. Breastfed infants can maintain normal vitamin D status in the early post-natal period only when their mother's vitamin D status in normal and /or the infants are exposed to adequate amount of sunlight.

7. Junk Food and Infant Feeding

a. Consumers are often bewildered by nutritive & health claims, while children are highly influenced by advertisements enticing them to buy a product which may be unhealthy or in fact detrimental (39).

b. The parents should understand that though the companies are promoting many foods as "Magic food" in reality such products don't exist.

c. Avoid Junk and Commercial food which are high in fat, sugar, salt & pesticides/ additives (HFSSP). Avoid giving ready-made, processed commercial food from the market, e.g. tinned foods/juices, colas & carbonated drinks, cold-drinks, chocolates, crisps, health drinks, bakery products etc.

d. Junk foods are one of the important reasons for the increasing incidences of childhood obesity. There is need to restrict consumption of junk food especially in and around educational institutions and remote areas of the country.

8. Maternal Nutrition

In India, 22% babies born each year have LBW, which has been linked to maternal under-nutrition and anemia among other causes. The mother's condition before pregnancy is a key determinant of its outcome; half of adolescents (boys and girls) have below normal body mass index (BMI) and almost 56% of adolescent girls aged 15–19 years have anemia.

B. Operational Guidelines

1. Recommendations for Governmental and International Agencies

a. Global legislation, binding to all states and private organizations including labor benefits, 6 (six) months maternity and appropriate paternity leave is strongly recommended. Maternity leave, day care facilities and paid breastfeeding breaks should be available to all employed women in all sectors including those

engaged in atypical forms of dependent work e.g. part time, domestic and intermittent employment.

b. Breastfeeding is a human right both for the mother as well as baby. With due weightage and respect to National Family Planning Policies and Program, the benefits should be given to mother and the child (even after 2 issues) born out of unplanned pregnancy (Family planning method failure) or as a result of accidental death of previous child.

c. Scientific and unbiased IYCF practices must be promoted through regular advertisements in state, public or private owned audiovisual and print media. Public should be made aware that artificial, junk or packaged food can be injurious to the health of the children.

d. Necessary and adequate arrangements should be made for propaganda and implementation of the provisions of Infant Milk Substitute (IMS) Act which prevents advertising or promoting infant milk substitutes. In addition, further strengthening of the existing Act must be tried.

2. Role of NGOs

a. Various programs or community projects should be initiated to provide home care and counselling on IYCF through formation of mother support groups especially by women's organizations.

b. The voluntary organizations should understand and advocate important recommendations at all levels. Various like-minded organizations should work preferably on the same platform and co-ordinate with each-other in promoting the IYCF practices.

3. Recommendations for Media

The Media can have a vital role to play in strengthening the knowledge chain, serving as **a.** link between the stakeholders and the community as "community is exposed to images, articles and ideas in innumerable ways" from TV, newspaper headlines, magazine covers, movies, websites, video games and road side signboards. Media has a great power but it is high time that it recognizes its responsibility towards child nutrition by :

a. Media has to take concrete steps to avoid directly or indirectly glamorizing/promoting bottle feeding, artificial, commercial and ready to use food. Instead, the risks involved in artificial feeding and other suboptimal feeding practices should be advertised prominently in bold prints.

b. Media support is even more important on certain occasions, celebrations, and social mobilization activities such as World Breast Feeding Week and Nutrition Weeks.

c. The companies & media should have self-regulatory pledge for responsible advertising/ marketing. They should help in promoting healthier dietary choices and a more active life style for Indian children.

d. Sportsman, Celebrities should not promote various products unless evidence based scientifically sound & authentic information is publicized.

4. Recommendations for Training

a. It is recommended that all the community health workers, PPTCT counsellors, and other personnel caring for children including doctors should undergo three days skill training on IYCF (including IMS Act). In situations where three day training is not feasible, some impact can be made with short duration sensitization programs (half day/one day).

b. IYCF should also be included in the curriculum of undergraduate and postgraduate medical education, nursing education, home science, child nutrition courses etc.

c. Anganwadi workers, ASHA, Dai`s and other grass root level workers should be empowered by basic, scientific information related to IYCF.

d. State, National and International Level workshops on IYCN should be organized at regular intervals for capacity building of IYCN Resource Personnel. A multi-sectorial effort should be initiated to create this skilled human resource.

Conclusion:

Mothers' own milk is considered to be the best source of infant nutrition. Extensive evidence has shown that breast milk contains a variety of bioactive agents that modify the function of the gastrointestinal tract and the immune system, as well as in brain development. Thus, breast milk is widely recognized as a biological fluid required for optimal infant growth and development. Recently, studies have further suggested that breast milk mitigates infant programming of late metabolic diseases, particularly protecting against obesity and type 2 diabetes.

The World Health Organization recommends that infants should be exclusively breastfed for the first six month of life. The American Academy of Paediatrics also recommends breastfeeding for at least 12 months. Recently, the Academy of Nutrition and Dietetics reaffirms and updates their mission that exclusive breastfeeding provides optimal nutrition and health protection for the first six months of life, and that breastfeeding with complementary foods from six months until at least 12 months of age is the ideal feeding pattern for infants. In addition to its nutritional advantage, breastfeeding is convenient and inexpensive, and also is a bonding experience for the mother and infant.

Although experts believe breast milk is the best nutritional choice for infants, breastfeeding may not be possible for all women. For many, the decision to breastfeed or formula feed is based on their comfort level, lifestyle, and specific medical situations. For mothers who are unable to breastfeed or who decide not to, infant formula is a healthy alternative. Formula provides babies with the nutrients they need to grow and thrive. The goal of infant feeding, above all, is to promote optimal infant growth, body composition, and development.

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