

Chapter 1

Nutrition During Infancy (0-12months) and of the Toddlers (1-2 Years)

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INTRODUCTION

Infancy is the period of life that is 0-12 months. During infancy, dietary intake and nutrient requirements of the infant is very important. The diet must provide sufficient nutrients for the growth and proper development of the infant. The first six months of the infant is a crucial period of life outside the womb. There is rapid growth and development. There is therefore the need for proper nutrition.

Chapter Objectives

By the end of studying this chapter, you should be able to:

1. Explain why adequate nutrition during infancy and early childhood is fundamental to the development of the child's full potential.
2. State five advantages of breast milk and breast feeding.
3. List five guidelines for feeding the infant.
4. Say the importance of complementary/supplementary foods to the infant.
5. Explain the characteristics of the toddler.
6. Comment on the following nutrients needed by the toddler; protein, vitamins carbohydrates and minerals.

Nutrition During Infancy (0-12 Months)

Adequate nutrition during infancy and early childhood is fundamental to the development of a child's full potential. The first six months of life outside the womb is crucial. It is a period of intensive growth in the life of an individual. An infant double its weight from 3kg to 6kg in four months, and then slows down, reaching about 9kg at one year. The length also increases rapidly. Within the first three months the baby gains about 20% of the birth length and by the end of the first year the total length is about 1 ½ times the birth length. The nutrient requirement of the infant is high per unit body weight because of the rapid growth rate.



A Two Weeks Old Infant

The consequences of poor nutrition in terms of food and feeding behaviours during the first year of life include significant illnesses, delayed mental and physical development and eventual death. Malnutrition is known to predispose the infant to the recurrence and severity of diarrhea and acute respiratory infections (ARI), among other diseases. In the long term, early nutritional deficits are linked to impairments in intellectual performance, work capacity, reproductive outcomes and overall health during adolescence and adulthood.

Poor breast-feeding practices are linked to all these. Adequate maternal nutrition during pregnancy and lactation are essential for proper breast feeding. **0-6 Months:** Breast milk meets the nutritional needs of the infant at this stage. WHO and UNICEF have recommended that infants be exclusively breastfed for the first six months of life. The composition of breast milk is sufficient to sustain the infant for this period.

Advantages of Breast Milk and Breast Feeding

1. Nutrition - Breast milk contains all the essential nutrients the baby needs for the first six months in the correct proportion. Breast milk is the liquid designed by nature as food for the new born providing the needed nourishment. The composition of amino acid, fatty acid and mild sugar in human milk is better for the neurological development of the brain and nervous system of the infant below the age of six months.

2. Immunological Benefits – Breast milk protects the baby against infections. The anti-infective and protective properties of human milk are derived from the presence of specific anti-infective substances (antibodies) and white blood cells. Extremely high concentrations of these protective factors are found in the colostrums produced in the first few days after birth. The protective and anti-infective factors include:

- Leucocytes – These are white blood cells (WBC) which engulf and kill bacteria.
- Immunoglobulin the main protective substance is secretory Immunoglobulin A (IgA). IgA is known to protect the mucosal surface of the gut acting as barrier until its own immune system can begin to provide protection.

These white blood cells and Immunoglobulin provide protection against many common bacteria such as staphylococci, streptococci, salmonella and Escherichia coli (major cause of Gastroenteritis). The mother's nipple "learns" the nature of these bacteria from the mouth of the baby.

- Also beneficial lactobacillus bifidus in breast milk creates an acid environment in the baby's intestine that kills harmful bacteria; this is why the breastfed baby's stool does not smell

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offensive. It prevents harmful bacteria from growing and causing diarrhea. The immune system of a breastfed infant obtains a considerable boost from breast. The mother's body then manufactures antibodies for these very bacteria and supplies them back to her baby in the milk as a natural medicine.



A Three Months Old Exclusively Breastfed Baby.

3. Breast feeding ensures a delayed exposure to cows' milk and therefore reduces the risk of developing allergy to cow-milk proteins.

4. There is also a future health benefit in exclusively breast-fed babies. Breast feeding confers advantages in terms of the later health of the baby. These advantages include less obesity, heart disease and multiple sclerosis, as well as better dental health.

5. Bonding – Breast feeding creates a closer relationship between mother and child, a unique loving bond. This can help the child's Psychological development.

1. Mothers Health – Breast feeding help mothers to protect against another pregnancy (child spacing). It delays the return of ovulation and menstruation. This depends on the suckling frequency.

Natural Qualities of Human Milk

Human milk is very different in composition from cow's milk. Unless altered, cow milk should not be used in infant feeding until the infant is 12 months old because cow's milk is too high in minerals and protein, does not contain enough carbohydrates to meet infant needs, and may trigger the development of diabetes in infants with genetic predisposition to the disorder. In addition, the major protein in cow's milk. Casein, is harder for an infant to digest than the major protein in human milk, lactalbumin. Current

TABLE 1: Composition of Mature Human Milk and Cows Mil

Composition	Human Milk	Cow's Milk
Water %	87.1	87.2
Energy (Kcal/100ml)	75	66
Total solid (g/100ml)	12.9	12.8
Protein (g/100/ml)	1.1	3.5
Fat (g/100ml)	4.5	3.7
Lactose (g/100ml)	6.8	4.9
Ash (g/100ml)	0.2	0.7
Mineral (per litre)		
Calcium (mg)	340	1,170
Phosphorous (mg)	140	920
Zinc (mg)	3-5	3-5

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Iodine (Ug)	30	47
Iron (mg)	0.5	0.5
Selenium (Ug)	13-50	5-50
Vitamins (per liter)		
Vitamins A (IU)	1898	1025
Vitamin C (mg)	43	11
Thiamin (Ug)	160	440
Riboflavin (Ug)	60	1750
Nircin (Ug)	1470	940

Ene-Obong , 2001

TABLE 2: Comparison of Human and Cow's Milk

	Human	Cow's
- Bacteria Contamination	None	Likely
- Anti-infective substances	Antibodies, leucocytes lactoferrin, lactobacillus bifidus	Not active Not present
- Protein	1%	4.% too much
Total	0.5%	3% too much
Casein	0.5%	0.5%
Lacto albumen		
- Amino acids		
Cysteine		
Taurine	Enough for growing children	Not enough
- Fat	4% (average)	4%
Total	Enough unsaturated fatty acid	Too much saturated fatty acid
Saturated Fatty acids	Enough for growing children	Not enough
Lino lice acid (essential)	Present	None Not enough
Lipase to digest fat	Enough	3-4% not enough
Cholesterol	7% - enough	
Lactose (Sugar)		
- Salt (MEq/L)		
- Sodium	6.5 correct amount	25 too much
- Chloride	12 correct amounts	29 too much
- Potassium	14 correct amounts	35 too much
- Minerals (mg/L)		
- Calcium	350 correct amounts	1,400 too much
- Phosphate	150 correct amounts	900 too much
- Iron	Small amount well absorbed	Small amount poorly absorbed
- Vitamins	Enough	May not be enough
- Water	Enough no extra needed	Extra needed

ENE-OBONG – 2001

studies show other possible benefits for the infant fed on breast milk in form of factors such as omega-3 fatty acids typically found in fish, are not present in cow's milk or infant formulas.

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A Five Months Old Exclusive Breastfed Baby.

Colostrum – This is the yellowish thick milk secreted for the first few days after delivery. When breast feeding starts immediately after birth, the baby has the opportunity to take colostrums. It has many advantages.

- i. It contains more antibodies, white blood cells and immune-system cells than later milk.
- ii. It gives the baby his/her first “immunization” against bacteria and viruses.
- iii. It is rich in growth factors which prepare the baby’s intestine to digest and absorb milk, and to prevent the absorption of undigested proteins.
- iv. It is a laxative and helps the body to pass meconium (the first dark stool) that helps to prevent jaundice.
- v. Lactobacillus bifidus factor, a component of the colostrum that encourage the growth of lactobacillus bifidus bacteria. These bacteria limit the growth of potentially toxic bacteria in the intestine. Overall, breast feeding promotes the intestinal health of the breastfed infant in this way.

Guidelines for Feeding the Infant:

1. Initiate immediate skin-to-skin contact with mother and support breast feeding within ½ hour of birth.
2. Put infant on the mother’s chest of stomach immediately after birth and support breast feeding.
3. Do not throw away the first milk (colostrums), it is important that the infant takes this.
4. Establish proper positioning and attachment.
 - Infant should be held close to the mother facing the breast with the infant’s ear, shoulder and hip in a straight line (belly to belly).
 - The infant’s mouth should open wide just before attaching so that the nipple and as much of the areola as possible are in the mouth, if the child is properly attached the lips are curled out ward with the tongue over the lower gum.
5. Breast feed exclusively from birth to six months of age.
 - Breast feed only, or when necessary feed expressed milk. Give no feeds and no water or other foods or liquids or local herbs. However, drops of syrups consisting of vitamins, minerals supplements or medication can be given when prescribed.
 - Mothers should drink enough water when thirsty and breast feed to satisfy the infants need for water (breast milk contains enough water for the infant).
6. Practice frequent-on-demand breast feeding day and night.

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- For best results, feed the infant from one breast until it is empty before offering the second breast. The infant should pass urine at least 5-7 times a day and produce stools regularly if intake of breast milk is sufficient.
 - The infant should be breastfed every 2-3 hours day and night (8-12 times in 24hours) or more frequently specifically during the first few months of life.
 - Encourage effective suckling and prevent the introduction of contaminants. Do not use bottles or pacifiers (dummies or artificial teats); if a mother has to miss a breast feed, she can maintain her supply by expressing milk when she would have breastfed. Expressed breast milk can be fed by cup at a later time. Expressed breast milk is safe for up to 8 hours at room temperature. If refrigerated or frozen it may be safe for up to 24 hours.
- b. **7-12 Months** – The child is still within the intensive growth period. Breast feeding should continue but the baby's nutritional needs have become greater than the mother's milk can supply. The child is now ready for the addition of other foods to complement breast milk. The quality of the breast milk is no longer sufficient even if the quantity is.

WEANING (7-12 MONTHS)

This is the gradual transition from liquid to solid foods. As the baby's body grows and the child becomes more active, more energy is needed for his/her sustenance so it becomes necessary to supplement the diet by adding certain foods at the latest by 6 months. Often the baby's weight stabilizes around six months of age and when baby cereal is introduced; the baby seems to be able to eat exaggerated amounts. It is not good to wean the baby at once. Instead the breast should progressively be replaced by baby food, with a weaning period of time variable for each child. This should be a transitional phase which should take place without risk if the foodstuffs are available; they are nutritionally adequate, hygienically safe and easily consumed and digested by the child.



A Seven Months Old Boy Now on Complementary Feeds

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Complementary/Supplementary Foods

These should be based on foods available at home or sold in the local market. Commercial products are also available. The type of pap and soft foods consumed determine the adequacy of nutrient intake. Since the main intent of weaning is to provide the child with more calories and needed nutrients, the food choice is of utmost importance. The main weaning diet in Nigeria is a cereal pap made from maize, millet or guinea corn. The nutritional quality of this pap is poor, energy content is low, protein and vitamin contents are virtually none. This is because during preparation of the pap, practically all the protein and vitamins are washed out. So only the pure starch (carbohydrate) is offered to babies. Therefore, it is necessary to improve on its quality by adding protein from plant or animal sources and also some fruits and vegetables.

There are complementary foods which are based on legume/cereal mix e.g. use of beans plus maize (cerebabe) or maize plus soybeans (nutrient). Ways of improving the nutrient density of complementary foods include:

- Addition of groundnuts/crayfish, soybeans and other legumes; palm oil, milk e.t.c.
- Food processing e.g. fermentation, germination or the use of amylase rich flours to thin down gruels (lowering its viscosity).
- Pureed fruits and vegetable can be added to improve the vitamin and mineral contents of the food. Eg. mashed bananas, pawpaw or strained and diluted orange juice, mashed vegetables, etc.

Each feed should be supplemented with formula milk/pap. This is the best way since the mother's milk helps in the digestion of the artificial milk. The supplementary feed can be fed alternately with the breast milk, but this is not as good as giving complementary feeds.

A baby's first cereal should be prepared with very fine gluten free flour (corn or rice for example) and should not be too thick. Feed baby with cup/plate and spoon. Do not use feeding bottles or pacifiers.

Guidelines for Feeding (7-12 Months)

Practice good hygiene and proper food handling – wash hands before feeding the baby. Increase the frequency of complementary feeding as the child grows older using a combination of meals and snacks while maintaining frequent breast feeding.

-Feed complementary foods (Semi-solid foods) 2-3 times daily increasing gradually to 4-5times. Always breast feed before each Complementary feeding.

Give vitamin A supplementation.

Gradually increase food consistency and add variety as the child grows older according to the child's requirements and abilities.

Feed pureed, mashed and semi-solid foods.

Introduce finger foods (snacks that can be eaten by children themselves) at about eight months of age.

Avoid foods that may cause choking.

Diversify the meal of both the breast-feeding mother and the child by including Fruits, Vegetables, fortified foods and/or animal products. Ensure that selected foods are rich in iron e.g. eggs.

Nutrition of The Toddlers (1-2years)

A toddler is a child of between 1-2years of age. At this period, the child walks with short feeble steps, that is, he toddles. He is now able to share in most of the dishes served to the family but requires relatively more protein of high quality than adults.

Toddlers vary in their needs but WHO and UNICEF recommended that breast feeding be continued up to 2 years of age as it can still provide the child with valuable nutrients.

Growth rate is high but less than that of the first year of life. The quality and frequency of feeding should be increased; more varieties of food should also be introduced at this stage.

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Guidelines for Feeding Toddlers

Continue to breastfeed until the child is 2 years of age. Give enriched cereals or mashed foods with crayfish, soybeans, groundnuts added at least three times a day feed fruits and vegetables, especially those rich in vitamin A. iron and other vitamins. Use fruits and vegetables that are in season. Give nutritious snacks at least twice daily e.g. banana, "awara", "moi-moi" groundnuts etc.

5. Give the modified portions of the family diet at meal times e.g. mash yams, potatoes etc to make them soft.

Use less pepper and spices. Avoid adding artificial colours and flavours.

- Avoid drinks with low-nutrient value and those with anti-nutrient factors e.g. Coffee, tea, and sugary drinks.

6. Practice good hygiene and proper food handling

- Care givers should wash their hands and the child's hands before food preparation and feeding the child.
- Store food safely and serve foods immediately after preparation.
- Do not serve stale warmed feeds.
- Use clean cup/bowl and spoon when feeding; avoid the use of feeding bottles as they are difficult to clean.

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Two Years Old Toddler

Nutrient Needs of Toddlers

Protein – This is needed for growth. Milk is the best source protein for the toddler; it is also a good source of calcium which the child requires for growth and for formation of strong bones and teeth. He should also be given lean meat, liver, poultry and eggs. Where milk and other animal protein are scarce, a good mixture of plant proteins, especially soybeans products would provide an excellent source of good protein for the toddler.

Vitamins- Toddlers require an extra supply of vitamin A, C and D either as special supplement or in the form of fruit juice and cod liver oil. This extra supply is necessary to prevent deficiency disease like scurvy blindness rickets etc.

Carbohydrates – Toddlers need energy because they are active. Cereals and other products like yam, potatoes etc. will provide them with the needed energy. These should be properly prepared. Some children eat too much and become obese. There is need to watch that weight gain is not excessive. An excessive consumption of sweets and candies spoil children's appetite for the main meal and can lead to dental problems.

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These problems can be avoided by preventing the child from consuming sweets. Always give the best part of the family food to the youngest child as he/she is still growing.

Review Questions

1. State the consequences of poor nutrition in terms of food and feeding behavior during the first year of life.
2. Explain the composition of mature human milk.
3. What are the advantages of colostrum for the baby?
4. How can weaning be best done without having any bad effect on the baby?
5. Give two reasons why WHO and UNICEF recommend that breast feeding be continued up to 2 years of age.

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