



A REVIEW ARTICLE ON NUTRITION IN INFANTS

Ambikaprasad Pandey¹, Swapnil Kaithwas², Rajneesh Kasoudhan³

¹Assistant Professor, Department of Kaumarbhritya, Ankerite Ayurvedic Medical College, Lucknow.

²Associate Professor, Department of Swasthavritta & Yoga, Ankerite Ayurvedic Medical College, Lucknow.

³Associate Professor, Department of Rasa Shashtra & Bhaishajya Kalpana, Ankerite Ayurvedic Medical College, Lucknow.

Corresponding Author: ambikapandey014@gmail.com

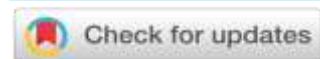
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ABSTRACT

Nutrition is converting food into energy and other vital nutrients required for life. Nutrients provide energy and biomolecules necessary for carrying out the various body functions. Nutrition is a critical part of health, growth and development. Better nutrition is related to improved child health, strengthens immune systems, and lowers the risk of diseases. Infants, i.e. from birth to one year of age, are a very crucial part of the life of a human being. Nutrition during this period defines how a child grows and develops into an adult, what his physique would be, what his immune system would be, etc. Various research has been done since the beginning and evolution of life sciences. This article will discuss infant nutrition concerning Ayurveda and modern sciences.

Keywords: Infant, Nutrition, Breastmilk, *Stanya*, *Annaprashana* etc

INTRODUCTION

Breastfeeding is the key to the survival of infants. Breastfeeding has been proven to be the ideal nourishment for the infant. Evidence shows that the benefits of breastfeeding are optimised when the infant is

exclusively breastfed for the first six months before the complementary food is introduced. Although breastfeeding is widely accepted in the whole world, exclusive breastfeeding has been reportedly due to

various reasons, such as reduced maternal feelings due to busy lifestyles and the increasing influence of the Western lifestyle on mothers. The infants' health revolves around the mother, so it is essential to assess the knowledge and awareness of lactating mothers regarding dietary practices during lactation and when complementary feeds are introduced. When milk production or ejection is deficient after six months of age, the infant's nutritional needs cannot be solely met by breastmilk; in these conditions, some alternative is required to provide the infant with adequate nutrition, failing which the infant's life may be compromised. As per the bulletin of the Registrar General of India, the infant mortality rate due to undernutrition was 30 per 1000 live births in 2019. 28 % of malnourished children constitute 68% of cases of stunting, wasting and other conditions in children under the age of 5.

Breast Feeding- Primarily under the discussion of nutrition, especially for an infant, there are two primary sources: breastmilk and complementary feeding. At times, different options like formula feeds are used in the scarcity of breastmilk. In due course, we will discuss breastmilk in detail, including its composition, benefits, alternatives, and complementary feeding.

Exclusive Breastfeeding (0-6 months of age)

An infant should be breastfed exclusively until the age of 6 months. During this phase, additional food or fluids are not required as breast milk is nutritionally complete for the child's growth and development. Breastfeeding protects the child from infections and strengthens the immune system. We would first know in detail about breastmilk as it is essential to an infant's growth and development. Composition of Breast Milk - The composition of breast milk varies at different time points of lactation to suit the baby's needs. The milk of a mother who has delivered a pre-term baby differs from that of a mother who has given a term baby.

- i. Colostrum is the milk secreted initially 3-4 days after delivery. It is small in quantity, yellow and thick and contains large amounts of antibodies and vitamins A, D, E and K.

- ii. Transitional milk is secreted after 3-4 days until two weeks—the fat and sugar content increases while the immunoglobulin and protein content decreases.
- iii. Mature milk follows transitional milk. It is thinner and watery but contains all the nutrients essential for optimal baby growth.
- iv. Preterm milk is the milk of a mother who delivers before 37 weeks. It contains more proteins, sodium, iron, immunoglobulins and calories as per the requirement of a preterm baby.
- v. Foremilk is the milk secreted at the start of a feed. It is watery and rich in proteins, sugar, vitamins, minerals, and water that quenches the baby's thirst.
- vi. Hindmilk comes towards the end of feed and is richer in fat, providing more energy and a sense of satiety.

Thus, the composition of milk also varies during the feeding phase. The baby needs colostrum, foremilk, and hindmilk for optimum growth. Therefore, the baby should be allowed to empty one breast before switching to another.

Benefits of Breast Milk - Nutritional superiority. Breast milk contains all the nutrients a baby needs for average growth and development in an optimum proportion and in a form that is easily digested and absorbed.

- i. Carbohydrates. Lactose is in a high concentration (6-7 g/ dl) in breast milk. Galactose is necessary for the formation of galactocerebrosides. Lactose helps in the absorption of calcium and also enhances the growth of lactobacilli in the intestine.
- ii. Proteins. The protein content of breast milk is low (0.9-1.1 g/dl) compared to animal milk. Most of the protein is in lactalbumin and lactoglobulin (60%), which the baby easily digests. Human milk also contains amino acids like taurine and cysteine, which are necessary for neurotransmission and neuromodulation; these are not present in cow milk and formula preparations.
- iii. Fats. Breast milk is rich in polyunsaturated fatty acids, which are necessary for the myelination of the nervous system. It also contains omega 2 and

- omega 6, which are long-chain fatty acids; these are important for forming prostaglandins and cholesterol, required as a base for steroid hormones.
- iv. Vitamins and minerals. The quantity and bioavailability of vitamins and minerals are sufficient for the baby's needs in the first six months.
 - v. Water and electrolytes. Breast milk has a water content of 88%; hence, a breast-fed baby does not require additional water in the first few months of life, even during summer. The osmolality of breast milk is low, presenting a low solute load to the kidneys.
 - vi. Immunological superiority. Breast milk contains several protective factors, including immunoglobulin, mainly secretory IgA, macrophages, lymphocytes, lactoferrin, lysozyme, Bifidus factor and interferon. Breastfed babies are less likely to develop infection. A breastfed baby is 14 times less likely to die of diarrhoea and almost four times less likely to die of respiratory disease.
 - vii. Other benefits. Breast milk contains several growth factors, enzymes and hormones. The epidermal growth factor in breast milk enhances the maturation of the intestinal cells and reduces the risk of allergy in later life. Enzymes like lipases increase the digestion of fats in the milk.

Now, we will discuss the options or alternatives in the absence or scarcity of breastmilk.

Absence/ Scarcity of Breastmilk

Expressed Breast Milk (EBM)

If a mother cannot feed her baby (e.g. ill mother, pre-term baby, working mother, etc.), she should express her milk in a clean, wide-mouthed container, which should be fed to her baby. EBM can be stored at room temperature for 6-8 hours, in a refrigerator for 24 hours, and in a freezer at -20 °C for three months. In *Ashtanga Hriday*, *Acharyas* mentioned the physiology of why there is an absence or scarcity in the expression of breastmilk.

सिराणां हृदयस्थानां विवृतत्वात् प्रसूतितः ।
तृतीयेऽहिनचतुर्थे वा स्त्रीणां स्तन्यं प्रवर्तते ।
अ.ह.उ.१/११

A female can have lactation deficiency for the first three days after delivery due to the lack of efficient opening of the *Stanyavahi siras*, which are attached to the hridaya.

In *Ashtanga Sangraha*, *Acharya* has said that a newborn should be exclusively breastfed until six months. However, he has advised some methods in case of the absence of breastmilk or a meagre quantity of breastmilk.

प्रथमे दिवसे तस्मात् त्रिकालं मधुसर्पिषी ॥
अनन्तामिश्रिते मन्त्रपाविते प्रशयेच्छिशुम् ।

Ananta churna should be given with honey and *ghrita* on the first day of life.

द्वितीये लक्षणासिद्धं तृतीये च घृतं ततः ॥
प्राङ्निषिद्धस्तनस्यास्य तत्पाणितलसम्मिमतम् ।
स्तन्यानुपानं द्वौ कालौ नवनीतं प्रयोजयेत् ॥

Lakshmana Kalka should be fried with the required amount of *ghrita* and be given to the child three times a day on the 2nd and 3rd days of life. A quantity of cow or goat milk equal to the cupped size of a palm can be given to the child two times a day.

Acharya says that it is possible that breastmilk would appear at least till the 4th day of life, but if still, no breastmilk is available, then the options are as follows.

- 1) Cow milk or goat milk
- 2) *Laghupanchamula kalka* cooked in cow's milk can be given.

स्तन्याभावे पयश्छागं गव्यं वा तद्गुणं पिबेत् ।
ह्रस्वेन पञ्चमूलेन स्थिराभ्यां वा सितायुतम् ॥

अ.ह.उ.१/२० Milk cooked in *shaliparni*, *prishniparni kalka* is mixed with sugar(mishri) stirred properly and given to the child.

वीरणशालिषष्टिकेक्षुवालिकादर्भकुशकाशगुन्द्रेत्कटकतृणमू
लानीति दशमानि स्तन्यजननानि भवन्ति ॥

च.सू.४/१२

Viran, *shali*, *shashtik*, *ikshuvalika*, *darbha*, *kusha*, *kasha*, *gundra*, *utkatak*, *trinmul* are the drugs *acharya charak* has mentioned in the *Stanyajanan*

mahakashaya. These drugs help in the formation and lactation of breast milk. These can be used in females who have very low production or absence of breastmilk.

पाठामहौषधसुरदारु मुस्त
मूर्वागुडूचीवत्सकफलकिरातिक्त कटुरोहिणी सारिवा
इति दशेमानिस्तन्यशोधनानि भवन्ति ॥

च.सू.४/१२

Patha, mahaushadh, surdaru, musta, murva, guduchi, vatsakfal, kiratikta, katurhini and sariva are the drugs mentioned in *Stanyashodhana mahakashaya*. These drugs help in the purification and improving the quality of breastmilk.

Donor Milk/Breastmilk Bank - Donor milk is procured directly from a wet nurse or stored at milk banks. The quality of the donated breastmilk can differ widely from person to person. Therefore, most centres typically use pooled donor breastmilk from multiple donors at different stages of breastfeeding. Centralised milk banks process this donor breastmilk after screening the donors and milk samples for communicable diseases (HIV, Hepatitis B, Hepatitis C, etc.). The milk is sterilised by pasteurization. Most donor milk banks require a negative drug screening from the women, and the milk is screened before pooling. The processed milk is frozen using a cold chain until ready to be employed at the bedside or for individual babies at home. Individual institutions often have their written policy on the use of donor breastmilk.

मातुरेव पिबेत स्तन्यं तद्वयलं देहवृद्धये ।
स्तन्यधात्र्यावुभे कार्ये तदसम्पदि वत्सले ॥ अव्यङ्गे
ब्रम्हचारिण्यौ वर्णप्रकृतेतः समे । निरुजे मध्यवयसौ
जीवद्वत्से न लोलुपे ॥ हितहारविहारेण यत्नादुपचरेच्च
ते । अ.ह.उ.१/१५-१६

In *Asthang Hriday Acharya* mentions the characters of *Dhatri* or the wet nurse, as follows

She should be of the same caste and race; she should be of young age, should not be a handicapped, should have *Stanyasampat* (having ideal breastmilk quali-

ties), be good in hygiene, skillful at work, has a love for a child, should be able to handle the child etc.

The Choice of Milk

Any liquid milk the family procures for household use can be given to the child without dilution. Children should preferably be given full cream milk, except for being overweight children. Most of the infant formulae available currently are fortified with iron and vitamins. To make their composition close to human milk, most formulae are nowadays also fortified with docosahexaenoic acid (DHA) and arachidonic acid (AA). They also are low in saturated fats and soy-based formulas and utterly devoid of cholesterol and lactose. Fresh liquid milk is suitable for feeding babies but is challenging to store. Hence, the milk should be boiled every time before use. During the first two months, pure cow's or buffalo milk may be diluted in 3 parts milk and one part water to reduce the kidney's protein load. Animal milk is less sweet due to the low lactose content; hence, mothers can add sugar according to the child's taste liking.

ते त्रिविधाः क्षीरपाः क्षीरान्नादा अन्नादा इति, तेषु
संवत्सरपराः क्षीरपाः द्विसंवत्सरपराः क्षीरान्नादाः
परतोऽन्नादा इति ।

सु.सू.३५.२९

Balya avastha has been from Birth to 16 years of age. Further, he has classified this *balya avastha* into three subdivisions, i.e. *Kshirapa, Kshirannada and Annada*. From birth to 1 year of age, the baby is called *Kshirapa*, i.e. age in which the baby consumes milk exclusively. From 1 to 2 years of age, the child is *Kshirannada*, i.e. the child consumes both milk and solid food, but still, the milk contributes to an equivalent proportion of feeding. After that, children from 2 to 16 years old are called *Annada*, which means the child consumes mainly solid foods.

Complementary Feeding (6 months onwards)

After the age of 6 months, breastmilk alone is not enough to make an infant grow well. Complementary feeding is food that complements breast milk and ensures the infant has enough energy, protein, and other nutrients for average growth and development.

Complimentary feeding is started at six months of age while continuing breastfeeding. Breastfeeding is encouraged up to two years of age. Between 6 and 12 months, the child goes through a

significant food transition that depends on essential cardinal factors.

Energy requirements of infants :

Age	Kcal/kg
Upto 3 months	120
3 – 5 months	115
6 – 9 months	110
9 – 12 months	105

तस्मिन्नेव मासि विविधानां फलानां प्राशनं भिषगनुतिष्ठेत् ।
तद्धि दन्तजातस्यान्नप्राशनं दशमे वा मासि प्रशस्तेऽहनि
प्राजापत्ये नक्षत्रे विचित्रसुसंस्कृतकामिकैर्वज्रनैः
समुदितमन्नपानं
का.खि.१२/१५

Acharya Kashyapa has mentioned Phalaprasana samskara at the age of 6month i.e. giving fruit juice to the baby at six months of age, thereby initiating the weaning, and *Annaprasana samskara* at the age of 10 months, i.e. giving solid, meshed food to the baby after eruption of teeth.

शालीनां षष्टिकानां वा पुराणानां विशेषः । तन्दुलैर्निस्तुषैर्भृष्टैः
क्षालितैः साधिता द्रवाः ॥ सस्नेहलवणा लेह्या बालानां
पुष्टिवर्धनाः । गोधूमानां तथा चूर्णं यवानां वाऽपि सात्म्यतः
का.खि.१२/१९,२०

Kashyapa Acharya, in *Annaprasana samskara*, says *Shali/ saathi, swastika, and laghu guna* content food can be given to the child. For a 12-month-old child, *Acharya Kashyapa* described preparations.

Preparation 1: Fried or roasted *Shali or shashtika* paddy rice with its external skin will be taken and mashed thoroughly. After that, it is added with *Sneha* and *Lavana* and stirred well until appropriately mixed. Then this preparation should be given in the form of *Avleha*.

Preparation 2: Powder/Churna of wheat or barley is given according to *Satmya* (suitability). *Acharya Vagbhat* mentioned *Annaprasana Sanskara* at the age of 6 months. After the teeth eruption, the child

should be gradually removed from breastfeeding. At this time, the infant can be given the following:

- 1) Cow's or Goat's milk.
- 2) *Chironji, Mulethi Churna*, honey, paddy slag, and Mishri should be adequately mixed and made in the form of 'Modak' (Candy) and given to the infant.
- 3) After the ignition of the digestive fire or the *Jatharagni*, the child can be given a mixture of *Belgiri churna, brihat ela*, sugar and *Dhan*.

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