UNIT 9 MEAL PLANNING FOR THE INFANT AND PRESCHOOLER

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9.1 INTRODUCTION

Growth and development are essential features of life. But the pattern of growth is not always uniform. In the last unit you studied how life begins with a single cell. This cell divides and multiplies into hundreds and thousands of cells to form the foetus. Imagine the rate of growth at this stage! Never again in life would the rate of growth be as rapid as it is during the foetal stage. After the foetal stage the growth continues to be rapid for the first year, but then slows down somewhat thereafter.

The present unit focuses on the pattern of growth in the first few years of life — from birth to six years. The first year of life is called the period of infancy and the period 1-6 years is referred to as the preschool years. Infancy and preschool period together are important in the child's life as they form the foundation for the future health of the child.

The changes in the pattern of growth influence the nutrient needs. Because the child is growing the nutrient needs are more. In addition, as the child grows, taste preferences, food advertisements, parents/friends will influence what food they consume. Feeding children, therefore, involves far more than knowing what are the nutrients required, why we need them and which foods contain them. We need to combine foods into a diet that would help meet the nutritional needs of children and at the same time be appealing and appetizing.

The unit presents a detailed discussion on how to plan/prepare balanced diets and what dietary measures are to be kept in mind while feeding infants and preschoolers. Reading through the unit you will find the answers to several questions which are often asked in connection with feeding young children — what is the right time to introduce infants to solid food? Which food other than breast milk can be given to the infant? How to provide nutritious meals to preschoolers keeping the likes/dislikes in mind? What are the best snacks/food-preparations for the preschoolers?

Objectives

After studying this unit, you will be able to:
• describe the periods of infancy and preschool age
• explain why these periods are crucial for growth and development
• describe the nutritional needs of infants and preschoolers
• discuss the importance of breastfeeding and supplementary feeding (i.e. introducing foods other than breast milk) and
• state the dietary considerations to be kept in mind while planning meals for infants and preschoolers.

9.2 THE INFANT

The child in the first year is referred to as an infant. The first year of life is a period of intense growth and development. Growth, as you already know, refers to the physical increase in the size of the body. The infant at birth weighs approximately 2.5-3 kg and measures 50 cm in length. With the rapid growth taking place the infant doubles its birth weight in five months and by one year the weight is three times the birth weight
Consider the rate of growth! Starting from 3 kg the weight increases to 9 kg in a single year. At no other time of life hereafter the rate of growth would be so rapid. The normal body length of 50 cm at birth also increases to about 75 cm by the end of the first year.

![Fig. 9.1 Average body weight of infants from birth to twelve months](image)

*Gain in weight/increase in length are, therefore, the best indicators to assess the child's growth.* Weighing the child every month, for the first year would give you a good idea of the pattern of growth.

The gain in height/weight are further accompanied by changes in tissues / organs/ systems of the body during the first year. The muscles grow in size and strength. The bones lengthen. The brain, kidneys, digestive system improve in their functional capacity. In other words, the body undergoes a process of development. The development of the digestive system, for example, enables the infant to handle more and more complex food items starting from breast milk at birth to solid food by the end of the first year.

Because of this extremely fast rate of growth/development infancy is a period of great stress for the baby. Obviously, diet plays an important role in promoting growth and general well-being. Can you imagine what would happen if enough food is not provided to the infant? Yes, of course, the infant would be susceptible to the effects of malnutrition. In fact, the infant would be more prone to infections and diseases resulting in ill health.

The rapid growth and development of an infant creates a high demand for nutrients. But, what nutrients are of particular importance during infancy? How much of which nutrient should be given to the infant? We shall learn about these aspects in the next subsequent section.

### 9.2.1 Recommended Dietary Intakes for the Infants

In Table 9.1 you would notice that the RDIs for Infants are given in two age categories — 0-6 months and 6-12 months. This is so because the age of the infant influences nutrient need. Rapid growth takes place during the first six months, which obviously necessitates a high nutrient intake.

The recommended intakes for infants during the first six months are based on the intake of normal growing infants fed on breast milk alone. What does this mean? This means that if an infant receives on average 850 ml of breast milk daily up to six months, his requirements as given in Table 9.1 are easily met. The requirements given above are, therefore, basically guidelines for feeding infants who, for some reason, cannot receive breast milk.
Table 9.1
Recommended Dietary Intakes for an Infant

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>RDIs</th>
<th>Age group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-6 months</td>
<td>6-12 months</td>
</tr>
<tr>
<td>Energy (Kcal)</td>
<td>2.05/kg</td>
<td>1.65/kg</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>0.2/kg</td>
<td>0.15/kg</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Iron (µg)</td>
<td>70/9kg</td>
<td>70/9kg</td>
</tr>
<tr>
<td>Vitamin A (µg)</td>
<td>750</td>
<td>600</td>
</tr>
<tr>
<td>Carotene</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Thiamine (µg)</td>
<td>75/9kg</td>
<td>60/9kg</td>
</tr>
<tr>
<td>Riboflavin (µg)</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Niacin (µg)</td>
<td>50/9kg</td>
<td>50/9kg</td>
</tr>
<tr>
<td>Ascorbic acid (mg)</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>Folic acid (µg)</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>Vitamin B12 (µg)</td>
<td>70/9kg</td>
<td>70/9kg</td>
</tr>
</tbody>
</table>

Source: Nutrient Requirements and Recommended Dietary Allowances for Indians, ICMR (1990)

Further, if you look at Table 9.1 carefully, you would notice that the RDIs for a few nutrients — energy, protein, iron and B vitamins — are given in terms of per kg body weight and not as a total intake figure. Can you suggest why this is so? This is because the needs for these nutrients per kg body weight are substantially different within the specific age category. The total amount of the nutrients required by the infant may seem much smaller as compared to the adult but when expressed in terms of per kg body weight, the need is over twice as much for most nutrients as can be seen in Figure 9.2. To understand this better let us compare the energy needs of a five month old infant with that of an adult. An adult sedentary man (weighing 60 kg), you know, requires a total of 2425 Kcal. This, when expressed in terms of per kg body weight, works out to approximately 40 Kcal/kg body weight. (This is considered 100 per cent RDI, for energy in Figure 9.2). The requirement of the infant (per kg body weight), on the other hand, is much higher i.e. 108 Kcal/kg body weight, which you notice is
more than twice as much as that of an adult. The total amount of energy required, however, works out to be much lower (i.e. \(108 \times 5 = 540\) kal) since a five-month infant weighs only about 5 kg.

The RDI for protein and certain protective nutrients like calcium, iron, vitamin C and vitamin A are also high. Why? You know that the tissue growth and body-building activity is considerable during the first year. This necessitates a high intake of protein and vitamin A. The bones and skeletal system develop rapidly and calcium is deposited in them, hence the requirement for calcium is high. The blood volume increases and therefore, iron is required for the synthesis of haemoglobin in the blood cells.

Check Your Progress Exercise 1
1) Fill in the blanks.
   a) Infancy is the period in the life of an individual from to ...................... year.
   b) The infant ...................... his birth weight in five months.
   c) The growth of the infant can be assessed by measuring ...................... and ......................
   d) The RDIs for ...................... and ...................... per kg body weight are considerably high during infancy.
   e) By growth we mean an increase in body size as a result of an increase in cell ...................... and ......................

2) State whether the following statements are true or false. Give reasons for your answers.
   a) RDIs for certain nutrients are expressed per unit body weight in the case of infants. (True/False)

   b) The requirement for iron (per kg body weight) is the least during infancy? (True/False)

   c) The infant should be weighed once in six months during the first year of life. (True/False)

   d) The infant increases comparatively more in length than in weight during the first year. (True/False)

   e) RDIs for infants during the first six months are guidelines for feeding infants who for some reason cannot receive breast milk. (True/False)

9.2.2 Meal Planning for the Infant

It is clear that the nutrient requirement is considerably high during infancy. The crucial aspect to consider then is how to meet these requirements. What are the foods that should be given to the infant that would help meet the requirement? This section presents a detailed discussion on these aspects.

You know that the first food normally given to the infant is breast milk. Breast milk supplies all the nutrients needed by the baby for the first few months. It is the best food for the baby. But after four to six months, breast milk alone is not sufficient to
meet the growing needs of the infant. Certain other foods need to be provided along with breast milk so as to supplement the shortfall in the nutrients. *This process of introducing foods other than breast milk in the diet of the infant is called supplementary feeding. It is also referred to as weaning.*

Supplementary feeding is a gradual process which begins from the moment other foods (liquid food preparations and solid food preparations) are started and continues till the time the child is completely taken off the breast. Any food other than breast milk given to the infant is referred to as a *supplement* or *supplementary* food. But what are supplementary foods that can be given to the infant? What is the right age to introduce these supplementary foods? Which food would be easily accepted and tolerated by the infant? How much of these foods should be given? You will find the answer to these questions in this section.

The specific considerations one should keep in mind in addition to those mentioned in the margin are discussed below:

**Whom are we planning for?**
- What is the stage of infancy — 0-4 months, 4-6 months, 6-8 months or 9-12 months?
- What is the expected body weight of the infant at that particular age?
- What is the income level of the family to which the infant belongs?
- Where does the infant live (region)?

Information on these aspects will help you decide on the RDIs and kind and amount of food to be served to the infant. Based on the information first list the RDIs for the infant.

**Which are the nutrients of particular importance?**
The need for the following nutrients is considerable during infancy:
- energy-giving nutrients (carbohydrates and fats)
- protein
- calcium
- iron
- vitamin A and
- vitamin C

**Which foods to select?**
During the first few months after birth, breast milk alone provides most of the nutrients required by the baby. Thereafter, in addition to breast milk, one should introduce supplementary foods. What are the supplementary foods that can be given? Before we go on to discuss this, let us first learn about the importance of breast milk. For your convenience the discussion in this subsection is given under three headings.
- Importance of breast milk
- When to introduce supplementary foods?
- What kind of supplementary foods should be given?

**Importance of breast milk:** Breast milk is the best and the only food for the infant for the first few months after birth. It contains most of the nutrients the baby needs. As soon as possible after birth, the infant should be put to the breast, since sucking stimulates milk production. But before milk is secreted colostrum is produced by the breast. Colostrum should be fed to the baby as it is good for growth and general well-being. What is colostrum? Why is it important to feed colostrum to the baby. You will find the answer to these questions in Highlight 2.

**HIGHLIGHT 2**

**Importance of Colostrum**

**During the first few days after child birth a thick, sticky yellowish fluid is secreted from the breast. This fluid is called colostrum. Colostrum is very beneficial for the infant, as it has life-saving properties. Colostrum has an especially high concentration of antibodies and white blood cells which protect the newborn from infections. It also contains certain growth promoting substances. The infant's body does not contain these substances nor does the body have the capacity to make them. These substances must be obtained from colostrum. Hence it is essential that the infant is breast-feed right from day one.**

Breast milk is secreted from the third or fourth day onwards. It is the most nutritious and balanced food. It supplies most of the nutrients needed by the infant, in the
correct amounts and proportions. Table 9.2 gives a comparative list of nutrients present in various milks/100 ml.

<table>
<thead>
<tr>
<th>Milk</th>
<th>Energy (Kcal)</th>
<th>Protein (g)</th>
<th>Fat (g)</th>
<th>Carbohydrate (g)</th>
<th>Calcium (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td>65</td>
<td>1.1</td>
<td>3.4</td>
<td>7.4</td>
<td>28</td>
</tr>
<tr>
<td>Cow's</td>
<td>67</td>
<td>3.2</td>
<td>4.1</td>
<td>4.4</td>
<td>120</td>
</tr>
<tr>
<td>Ass's</td>
<td>48</td>
<td>2.1</td>
<td>1.5</td>
<td>6.5</td>
<td>80</td>
</tr>
<tr>
<td>Buffalo's</td>
<td>117</td>
<td>4.3</td>
<td>6.5</td>
<td>5.0</td>
<td>210</td>
</tr>
<tr>
<td>Goat's</td>
<td>72</td>
<td>3.3</td>
<td>4.5</td>
<td>4.6</td>
<td>170</td>
</tr>
</tbody>
</table>


Compare the nutrient composition of human milk with that of other milk given in Table 9.2. What do you notice? Yes; breast milk does have a low concentration of certain nutrients as compared to other animal milks (i.e. cow's, buffalo's, goat's). So, how do we say that breast milk is nutritionally adequate? We say so because the amount and proportion of nutrients present in breast milk is ideal for supporting the growth of the infant. All nutrients are present in just the amounts required by the baby. A high protein and mineral content as seen in buffalo's, cow's milk is not good for the baby as it imposes a great strain on the excretory capacity of the infant's immature kidneys. Breast milk, on the other hand, suits the baby's tender digestive system and it gets easily assimilated in the body. Breast milk, however, has a high content of carbohydrates (specially lactose), essential fatty acids and certain protective nutrients like vitamin A, and vitamin E which are beneficial for the infant.

Besides nutritional adequacy, breast milk has other advantages as well which are listed in Figure 9.3.

**BREAST MILK IS THE BEST FOOD FOR THE INFANT**
- It protects the infant from infections and food allergies
- It is free from contamination
- It is safe and easily available
- It is economical
- It helps to develop a strong bond between mother and child.

Check Your Progress Exercise 2
1) Explain the following statements in two to three lines.
a) Breast milk is nutritionally adequate.

b) Breast milk has protective functions.

c) Colostrum has life-saving properties.

When to introduce supplementary foods: In many families you would have noticed that the introduction of solid food is associated with a religious ceremony commonly known as 'Anna Prashna'. This ceremony takes place at around 6 months in some communities and in some as late as one year. But, what is the right time for supplementary feeding? The right time to start with supplements is between four to six months. If you start too early you risk diarrhoea and if you start too late you risk malnutrition. Hence introduce supplementary foods only around 4-6 months. But continue breastfeeding.

What kind of supplementary foods should be given: In general, based on the age of the infant, one could vary the texture and consistency of the supplements as follows:

(a) Liquid Supplements at — 4-6 months
(b) Semisolid to solid supplements — well cooked and mashed between 6 - 8 months
(c) solid supplements — chopped or lumpy between 8-12 months

Let us learn what liquid and solid supplements can be given.

a) Liquid Supplements: To begin with, at about 4 months, along with breast milk, certain liquid supplements like juices, soups or other milk substitutes (like animal milk) can be given (Figure 9.4). Juices of seasonal fruits such as oranges, musambi and grapes provide protective nutrients (likely vitamin C) which are not present in
sufficient amounts in breast milk. Alongwith fruit juice, soups of green leafy vegetables may be given. The soup can be prepared by boiling the vegetable in minimum water and a little salt and then straining it through a sieve. The liquid obtained may then be fed to the baby. In addition, thin dal soup can also be given.

Now, what we need to know is how much of these liquid supplements should we give to the infants? In the early stages fruit juices can be diluted with equal amounts of boiled water and only a couple of teaspoons can be fed. Thereafter, the amount can be gradually increased and at the same time the dilution can be cut down. In a few weeks the baby can be given 3 ounces or 85 ml (a little less than half glass) of orange juice or the soup.

A word of Caution: Juices, soups when diluted with excess water and strained may not be able to provide adequate nutrients. Hence, it is advised to use minimum of water for dilution. Similarly mash the dal with the water used for cooking and feed it to the infant instead of serving ‘dal ka pani’.

b) Semisolid and Solid Supplements: As the child grows, the kind and quality of food given changes. From liquid supplements there is a gradual transition to semisolid/solid foods (Figure 9.5). The first solid food commonly offered at 5-6 months is a soft thin, liquidy porridge made from the staple food of the community. The porridge can be prepared by cooking the cereals (i.e. wheat, rice, semolina etc.) with milk and sugar. Such a preparation is called the basic mix i.e. when the staple (cereal) has one food (usually a protein source) added to it. A common basic mix served to the infants in the south is ‘ragi kanjee’ and in the north ‘suji kheer’. A few other common examples of basic mix with the method of preparation is given in Annexure 3 at the end of the block.

A staple porridge can be made with any cereal flour - maize, jowar, sago, semolina etc. The addition of just one-fourth to half a teaspoon of germinated wheat flour to the porridge will ensure that it does not thicken at all and will be in a form that the baby can swallow easily. What is this ‘germinated wheat flour’? Why are we suggesting the use of this in the porridge? What is its role in making thick porridges thin? Information on this new interesting concept is given in Highlight 3.

Other than the porridge, starchy fruits and vegetables which are cooked well and mashed can be given round 5-6 months. Roots and tubers, vegetables that can be given in the mashed state include potatoes, sweet potatoes, yam, carrots, green leafy vegetables. It is advisable to boil these vegetables in minimum water till tender and then to mash them properly. The mashed vegetable can be fed as such or with a little salt or/and ghcche/butter could be added to provide more energy. Remember, only the pulp of vegetables is to be given. The skin and seeds, if any, and other fibrous matter is to be discarded.
Among the fruits — bananas, papaya, mangoes or any other seasonal fruit could be mashed and given as such, whereas, other fruits like pineapple, peaches etc. need to be first stewed (i.e. boiled in a little water and sugar till tender) and mashed before being served. Remember to discard skin, seeds of the fruits before serving.

Other supplements which could be given include yolk of a hard-boiled egg, finely minced and cooked meat, mashed fish (without bone), well cooked and mashed dals. NOTE: Salt, can be added to taste. Small amount of fat (i.e. butter) can also be added to provide more energy.

Along with all these supplementary food remember breastfeeding should be continued.

HIGHLIGHT 3
Reducing the bulk of thick staple porridges

Staple porridges especially cereal based porridges have the disadvantage of being bulky. Rice, for example, absorbs more than twice its own volume of water before it becomes soft enough. Even small amounts of rice when cooked become bulky. It is, therefore, very difficult for the infant to eat this at one time. His stomach is also too small to take all this bulk. So what does one do? One could quite simply dilute the preparation with water and serve. But by diluting with water the nutrient content of the preparation will be lowered. We need to avoid this. Instead one other simple way of making thick/bulky porridges thin would be to add a few grams of Amylase-Rich-Food (ARF) to the porridge. What is ARF? ARF is nothing but flour obtained from germinated grain. Germinated grain flour contains a lot of amylase (an enzyme) which makes the porridge soft, thin and easy to eat, without taking away any of its nutritive value. (Amylases as you studied in Unit 2, Block 1 are enzymes which aid in splitting starches).

All that a mother has to do is to germinate 200 g of wheat grain (by soaking them in triple volume of water for 12 hours, and then wrap it in a wet cloth for 48 hours), sun dry (6-8 hours) them, remove the sprout and then make a powder of the remaining grains (Figure 9.6).

Cereal grains like bajra, jowar, maize may also be used to make the powder. This powder can be stored in an air-tight container for one month. It will suffice for one child’s porridge for 30 days. Use only few grams i.e. 1-2 g (not more than one-fourth of a teaspoon) of this powder in the porridge. You would notice that the porridge becomes thin and can be easily swallowed.

c) Solid Supplements: By eight months, you would notice that the baby starts teething. This is the right time to change him over to chopped and lumpy (thick) foods. The foods which were boiled and mashed earlier should be now just boiled and cut into
small pieces before being served. For instance, vegetables like potato and carrots could be boiled and cut into small pieces. Minced meat and fish could be boiled and served as such instead of mashing. Soft cooked rice or small pieces of chapati may also be introduced at this stage.

As the infant is teething, it is beneficial to give more of crunchy foods like a hard biscuit or a piece of toast/rusk or a slice of raw carrot or a fruit segment (seeds and skin removed) which would be ideal for the child to chew. These foods would aid in teething and provide exercise to the gums.

In addition to this, thick porridges can be prepared and served to the infant. Earlier you studied about the basic mix i.e. cereal porridges prepared by adding milk and sugar. Now other than milk, foods like pulses, animal foods, green leafy vegetables, other vegetables can also be added to the staple to form a multimix (Figure 9.7). When the staple i.e. the cereal has more foods added to it, (protein source plus vitamin/mineral source) we call it a multimix. A commonly used multimix in the north is ‘khichri’ and ‘pongal’ in the south. Multimixes can be prepared by mixing the following food items:

(a) Cereal + pulse + green leafy vegetable

or

(b) Cereal + pulse + milk

or

(c) Cereal + pulse + vegetable + curd

or

(d) Cereal + animal food + green leafy vegetable

or

(e) Cereal + milk + fruit + nuts (finely ground)

or

(f) Cereal + animal food + green leafy vegetable

or

(g) Cereal + animal food + orange yellow vegetable (carrot, pumpkin etc.)
Multimixes can be introduced as early as 6-7 months of age. You could add one-fourth of a teaspoon of ARF powder to the multimix to make it thin and easy to swallow. Some of the multimixes or infant foods that can be prepared daily for the infants are given in Annexure 4 at the end of the block.

What foods to give at 12 months i.e. one year? By the age of one year (i.e. 12 months) the baby can take all solid foods. In fact, the infant should be eating foods prepared for the family, for example rice/dal; chapati/dal; rice/fish; chapati/subji. A chapati can be crumpled into small pieces and softened with milk, dal or curd and salted or sweetened according to the baby’s taste and served. Rice can be served with dal and vegetable all mixed well. Attempts should be made to get the infant slowly on to the family meal pattern. Along with these foods breastfeeding should be continued. But if breast milk has ceased, then the child can be given half a litre of animal milk per day either as such or as curd, cottage cheese or milk pudding or porridge.

Along with the supplementary foods, one should provide plenty of water/fluids to the infants. Small amounts of boiled and cooled water should be given 2 to 3 times a day or more often, depending on the need. More water needs to be given during hot seasons and especially if the baby has diarrhoea.

What should be meal pattern?
The type and quality of food given would depend on the age of the infant. Consider the meal patterns A, B, C and D.

<table>
<thead>
<tr>
<th>Meal Pattern A</th>
<th>Meal Pattern B</th>
<th>Meal Pattern C</th>
<th>Meal Pattern D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 months</td>
<td>4-6 months</td>
<td>6-8 months</td>
<td>8-12 months</td>
</tr>
<tr>
<td>Birth-2m:</td>
<td>4-6 months</td>
<td>6-8 months</td>
<td>8-12 months</td>
</tr>
<tr>
<td>Breast milk</td>
<td>On waking</td>
<td>On waking</td>
<td>On waking</td>
</tr>
<tr>
<td>7-8 times a day</td>
<td>Breast milk</td>
<td>Breast milk</td>
<td>OTHER</td>
</tr>
<tr>
<td>8 AM-Fruit juice</td>
<td>9 AM-Mashed</td>
<td>9 AM-Mashed fruit/vegetable</td>
<td>11 AM-Fruit cut into pieces</td>
</tr>
<tr>
<td></td>
<td>10 Am-Mashed</td>
<td>11 Am-Breast milk</td>
<td>1 PM-Multimix</td>
</tr>
<tr>
<td>From 2m-4m:</td>
<td>12 PM-Breast milk</td>
<td>1 PM-Porridge</td>
<td>4 PM-Breast milk/other milk</td>
</tr>
<tr>
<td>Breast milk</td>
<td>2 PM-Dal soup</td>
<td>4 PM-Breast milk</td>
<td>6 PM-Rusk/Biscuit/a slice of bread</td>
</tr>
<tr>
<td>6-7 times a day</td>
<td>4 PM-Breast milk</td>
<td>6 PM-Porridge</td>
<td>8 PM-Multimix</td>
</tr>
<tr>
<td></td>
<td>6 PM-vegetable soup</td>
<td>8 PM-Breast milk</td>
<td>10 PM-Breast milk</td>
</tr>
<tr>
<td></td>
<td>8 PM-Breast milk</td>
<td>10 PM-Breast milk</td>
<td>10 PM-Breast milk</td>
</tr>
</tbody>
</table>

From birth to four months only breast milk is to be given. There is no rigid rule for the number of times the infant should be fed each day. Feeding on a self-demand schedule is recommended. However, roughly 6-8 feeds can be given during the first few months which can be reduced slowly. By the age of 6 months babies should be given some staple based porridge about twice a day. One to two teaspoonfuls are enough to start with, followed by about 3-6 large spoonfuls at each feed subsequently. By 9 months, however, atleast 4-5 supplements in addition to regular breastfeeding should be given.

The frequency of breastfeeding should be gradually reduced. In fact, by the time the child is 12-18 months, attempts should be made to take the baby off the breast. By one year, the child is capable of eating and digesting a variety of foods. The child is ready to eat the family food i.e. chapati, dal, rice, vegetables etc. But the child may not be able to eat much at one time. On the other hand, the child’s energy needs, are greater than is indicated by its size. So the problem is how to provide enough energy food to the child. The answer is:

- feed the child frequently – five to six times a day in addition to breast milk and
- enrich the child’s food with a little oil or fat.

Simple tips on infant feeding are listed in points to remember.

**POINTS TO REMEMBER**

**Infants**

1. Breastfeed the baby soon after birth and feed frequently on demand.
2. Breastfeed for as long as possible (atleast one to one and a half years).
Supplementary feeding:
1) Start supplementary feeding when a child is between 4 to 6 months of age.
2) Introduce clean and strained liquid supplements like juice or soup at 4-6 months.
3) Give well cooked and mashed supplements at 6-8 months.
4) Give to the infants aged 9-11 months rusk, biscuits, pieces of carrot, cucumber to chew.
5) Start giving the infant whatever is cooked for the family by the age of one year.
6) Feed infants (of 10 months to 1 year) solid foods 5-6 times a day.
7) Give such foods to the infant which are seasoned lightly (preferably only with salt); all other spices should be avoided.
8) Offer a balanced diet; prepare nutritious mixes, using combination of foods.

How to feed the infant:
1) Introduce only one food at a time; give enough time to the infant to get familiar with each food, before introducing another one.
2) Give as much as the baby wants at a time; refrain from forcing the infant to eat.
3) Try any new food a number of times; don’t give up if the infant refuses it initially; continue giving the food; the infant will slowly develop a taste for it.
4) If a baby does not like a particular item, change it or give it in a different form e.g. if milk is disliked — give ‘dahi’ (curd), it is as good as milk.
5) Introduce a variety of foods to the infant so that in time he learns to accept various foods.

Cleanliness and hygiene:
1) Wash hands before cooking and giving food.
2) Make sure all foods and the utensils used to prepare and serve the food are clean.
3) Water used for any preparation should be clean and boiled.

From our discussion so far you would have got an idea about infant feeding. Now consider the case of Lata. Lata had a baby two weeks back. Like most mothers she started breastfeeding her baby right from day one. But to her dismay, she found she was unable to feed her baby because of the inability to secrete adequate breast milk. Lata was very worried. She consulted her doctor. The doctor diagnosed her condition as Lactation Failure. Lactation failure refers to the inability of the mother to secrete breast milk. There is either a deficient supply of milk or at times there is no milk secretion. Under such circumstances what should Lata do? We are already aware about the high nutrient need during infancy. How should Lata meet the needs of her growing baby? She need not worry. For her and for many women like her here is a detailed discussion on Infant feeding in lactation failure in Highlight 4.

HIGHLIGHT 4
Infant Feeding in Lactation Failure

If a mother is unable to breastfeed, there are other substitutes available to feed the baby. One such substitute is animal milk i.e. cows, buffalo’s, goat’s milk.

From the different animal milks available, cow’s milk is best suited for the infant, since its nutrient composition is somewhat similar to that of breast milk (Table 9.2). But cow’s milk like the other animal milk; contain more protein as compared to human milk. So in order to make it comparable to breast milk, it needs to be suitably diluted with clean boiled water to lower the protein content and bring it closer to the level of protein as present in breast milk. But how much of water should be added? During the first few weeks the dilution for cow’s milk should be in the proportion of 2:1 i.e. 2 parts of water to one part of milk. This proportion of water is subsequently reduced so that by 2-3 months the milk is diluted in the proportion 3:1 i.e. 3 parts milk to one part water. By six months the infant can be given whole cow’s milk, without dilution. In case of buffalo’s milk, which is very rich in fat (hence difficult to digest), one could first boil the whole milk and allow it to stand for some time. The thick cream formed on top can be removed. This will reduce the fat content, as well as, some protein from the milk. The milk can then be diluted in the proportion of 3:1 (i.e. 3 part of milk to one part of water) for the first 2-3 months only and then served to the infant. Later, after 2-3 months it can be given without dilution.

Another point that needs to be considered is that human milk contains more sugar, as compared to other animal milk. Now, when animal milk is diluted, the sugar content falls far below that of human milk. Thus to improve this milk, one
would need to add a little sugar. About one level teaspoonful, i.e., 5 g can be added into 75-100 ml of milk.

Now the question that needs to be answered is — how much of this milk should be given to the baby? Well, the quantity of feed will vary, to a certain extent, with each baby. However, Table 9.3 gives an approximate idea about the quantity to be served.

Table 9.3: Approximate amounts of other milk served to the infants

<table>
<thead>
<tr>
<th>Age of infant</th>
<th>Approximate amount and number of feed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birth to 1 month</td>
<td>50-75 ml, 6-8 times a day</td>
</tr>
<tr>
<td>1 month to 2 month</td>
<td>75-100 ml, 6-8 times a day</td>
</tr>
<tr>
<td>2 month to 4 month</td>
<td>100-125 ml, 5-6 times a day</td>
</tr>
<tr>
<td>4 month to 6 month</td>
<td>150-175 ml, 5-6 times a day</td>
</tr>
<tr>
<td>Beyond 6 months</td>
<td>175-200 ml, 4-5 times a day</td>
</tr>
</tbody>
</table>

Along with this milk, other supplementary foods should be introduced at about 4-6 months of age.

One should also remember that the milk given to the infant should be boiled. All the utensils used for cooking/feeding should be washed in clean water and steamed or boiled to kill the germs.

Check Your Progress Exercise 3
1) What do you understand by supplementary feeding?

2) Fill in the blanks.
   a) Supplementary feeding should begin around __________ months.
   b) __________ and __________ foods should be given at 6 months.
   c) When the child starts teething __________ and __________ foods should be given.
   d) Infants cannot eat much at one time. They need __________ feeding.
   e) Along with supplementary feeding __________ should be continued.
   f) In case of lactation failure __________ milk is best suited for the baby.

3) Note down some of the staple porridges or multimixes used in your community.

9.3 THE PRESCHOOL CHILD

Who is a preschool child? Here we will consider a child in the age group 1-6 years as a preschool child.

From the growth and development standpoint, the preschool child, like the infant is extremely vulnerable. A preschooler grows rapidly, but when compared to infancy, the rate of growth is somewhat slower and more gradual. The average gain in weight during the preschool age is only about 2-2.5 kg each year as can be seen from Figure 9.8. It is, however, interesting to note that the preschool child gains
comparatively more in height than in weight. By three years the child is about 93 cm tall and by four years about 100 cm tall. Because of this the child gives an appearance of being tall and thin as compared to the round and chubby appearance characteristic of infancy. Another characteristic feature of the preschool child is the increased physical activity. The infant from being dependent on the mother moves on to becoming independent especially in terms of gaining control over the body. The increased physical activity and the growth taking place during the preschool stage necessitates a higher intake of nutrients.

Regular weight gain is the most important sign of the child's overall health and nutritional status. Weighing the child once every three months during the second year, and subsequently once a year, till the child goes to school, would give a good indication of the child's growth. Any subnormal growth or growth failure can be easily detected and corrected. It is important to mention here that it is during the early years of childhood i.e. 0-6 years, that "catch-up" growth is possible. What do you mean by "catch-up" growth? To understand this, consider a case of growth failure i.e. a child, whose height/weight is considerably lower as compared to other children of his age. Now, if during infancy and preschool years right inputs i.e. good diet and clean, safe hygienic living conditions are provided, it will be possible for the child to make up for the earlier deficit in growth and development. From this standpoint, therefore, preschool period is very crucial. Diet plays an important role in promoting good health. Let us now study the influence of above mentioned factors on the nutrient needs of a preschool child.

9.3.1 Recommended Dietary Intakes for the Preschool Child

The recommended dietary intake that would support optimum growth and development of the preschool child is given in Table 9.4.

<table>
<thead>
<tr>
<th>Nutrients</th>
<th>RDIs</th>
<th>Age group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (Kcal)</td>
<td>1240</td>
<td>1690</td>
</tr>
<tr>
<td>Protein (g)</td>
<td>22</td>
<td>30</td>
</tr>
<tr>
<td>Calcium (mg)</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Iron (mg)</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>Vitamin A (µg)</td>
<td>Retinol 400</td>
<td>400</td>
</tr>
<tr>
<td>or Carotene</td>
<td>1600</td>
<td>1600</td>
</tr>
<tr>
<td>Thiamine (mg)</td>
<td>0.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Riboflavin (mg)</td>
<td>0.7</td>
<td>1.0</td>
</tr>
<tr>
<td>Niacin (mg)</td>
<td>8.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Ascorbic acid (mg)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Folic acid (µg)</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Vitamin B₁₂ (µg)</td>
<td>0.2-1.0</td>
<td>0.2-1.0</td>
</tr>
</tbody>
</table>

Source: Nutrient requirements and Recommended Dietary Allowances for Indians, ICMR (1990)
The preschool years represent the age from approximately 1 year to 6 years. It is obvious that at any given age the nutrient need would vary depending on the level of growth and physical activity. This is the reason why the nutrient need of the preschool child is given under two categories — 1-3 years and 4-6 years in Table 9.3.

The total energy requirement of the preschooler increases with age, but if you were to calculate per kg intake you would notice that in comparison to early infancy (0-6 months), the requirement is markedly less. This of course is attributed to the gradual and slower rate of growth typical of preschool years.

The requirement for other nutrients (in proportion to body size) is also high but the need for a few nutrients like protein, calcium, vitamin A and iron is the most. This is so because these nutrients support the growth and development of the body. A preschool child is more prone to infections and diseases hence protective nutrients, especially vitamin A and iron are particularly important. The diet of the preschool child must provide sufficient amount of these nutrients.

### Check Your Progress Exercise 4

1) Fill in the blanks.
   a) The preschool stage is the period from ........... to ........... years.
   b) As compared to infancy, growth during the preschool stage is .............. and more ..............
   c) The preschool stage is characterized by increased .............. activity.
   d) The dietary requirement for .............. and .............. is high in the case of the preschooler.
   e) A preschooler increases more in .............. than in ..............
   f) The gain in weight during the preschool years is only .............. kg each year.

### 9.3.2 Meal Planning for the Preschool Child

The preschool years are the time to establish good eating habits in children. At the same time the influence of parents, friends, television, activities associated with food, help to shape the child’s food habits. Providing an adequate diet for the child is, therefore, a challenging task. What dietary measures should one keep in mind while planning/preparing a diet for children? How to plan balanced meals keeping the likes/dislikes in mind? How much of which food item should be included? These are some of the questions which are often asked in the context of feeding preschoolers. In this subsection, you will find the answer to these questions.

We begin meal planning for the preschool child by taking into consideration the basic four factors listed in the margin. The other considerations include:

**Whom are we planning for?**
- Is the child in the 1-3 year age group or in the 4-6 year age group?
- What is the income of the family to which the child belongs?
- Which region does this child belong to?

Information on these aspects would help us select the right kinds of foods (in the right amounts and proportions) that would be included in the day’s diet. Based on the information the RDIs can be listed.

**Which are the nutrients of particular importance?**

Some of the nutrients which are crucial for the growth and development of a preschool child include:
- Energy-giving nutrients (carbohydrates and fats)
- Protein
- Calcium
- Iron and
- Vitamin A

**Which foods to select?**

The diet of the preschool child must include at least one food item from each of the three major food groups namely energy-giving, body-building and protective / regulatory. But you are also aware that the need for energy, protein, calcium, iron and vitamin A is considerable during the preschool age. Hence, include more of
energy-rich foods, specially cereals; protein-rich foods such as pulses, meat, egg; calcium-rich foods particularly milk and milk products and iron-rich foods such as meat (particularly liver) pulses and green leafy vegetables in the diet. A list of food items rich in energy, protein, calcium and iron is given in Annexure 1. You could consult it and select food items according to the likes/dislikes of the child and availability of the food item. As for the vitamin A-rich food sources one can select one or two of the following foods as indicated in Figure 9.9.

We are Vitamin A rich foods

We help maintain good health.

Fig. 9.9 Preschoolers need foods rich in Vitamin A

What should be the meal pattern?
Always remember that a regular meal pattern should be maintained. Too long or too short an interval between successive meals should be avoided. The preschool child may not be able to eat much at one meal. Hence, small frequent meals need to be given. A preschool child would benefit from three small meals plus 2 to 3 snacks in-between meals per day. The meal pattern adopted would actually depend on the age of the preschool child. Consider the list of meals given under A and B.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Morning</td>
<td>Early morning</td>
</tr>
<tr>
<td>Breakfast</td>
<td>Breakfast</td>
</tr>
<tr>
<td>Mid-morning meal</td>
<td>Mid-morning meal</td>
</tr>
<tr>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>Mid-afternoon meal</td>
<td>Tea</td>
</tr>
<tr>
<td>Tea</td>
<td>Dinner</td>
</tr>
<tr>
<td>Dinner</td>
<td>Bed Time</td>
</tr>
</tbody>
</table>

A) is likely to be adopted for a 1½ year old child. The child needs to be given food every 3-4 hours. Atleast 2-3 milk feeds (early morning, tea, bed time) should be given. In addition foods of high protein and energy content should be given 4-5 times a day.

B) is likely to be adopted for a 3-5 year old child. In addition to 2 milk feeds, and three main meals (breakfast, lunch, dinner) other nutritious foods, snacks and food preparations should be served in-between meals.
What are the food preparations/snacks suitable for the preschool child?

Any snack/food preparations based on the common locally available cereals and pulses can be prepared. The snack should provide an average 300-400 kcal. But, ensure that the bulk of the preparation fed to the child is not very large. A child will remain healthy and well nourished provided food/snacks of high energy / protein / calcium / vitamin A content are given (without increasing the bulk/volume). Snacks should supplement not substitute the main meals. Snacks should be such that are easy to prepare and should be in a form easily handled by the child. A few ideas for snacks for preschool children are given in Annexure 5.

What are the other specific considerations?

i) Mealtime for children should be relaxing and enjoyable. Children learn to enjoy food when they are allowed to feed themselves. It is easier for the child to feed on his own if food is cut into bite-sized pieces can be readily handed and lifted to the mouth. Children like foods that can be eaten with the fingers (Fig 9.10).

ii) When introducing new foods to the child, offer one at a time. Give only small amounts at first. Let the child make the decision of liking or disliking the food. Never make an issue of food acceptance. Forcing the child to eat a particular food may establish an unfavourable attitude towards that food. If the food is rejected, wait for a few weeks and then try again.

iii) Children of preschool age develop very strong likes and dislikes for certain foods. They might avoid eating one or more essential foods. For example, green leafy vegetables, milk are usually disliked by children. In such situations, therefore, it is advisable to change the form of the food and then serve it to the child rather than totally omit it from the diet. Fewer difficulties are likely to be encountered if foods which are disliked by children are given when the child is hungry.

iv) Children are easily influenced by the parents attitudes towards food. Parents should, therefore, be extra careful of not to express their likes and dislikes in front of children (Figure 9.11). Rather they should eat a variety of food and encourage the child to do the same.

v) Foods served to children should be warm and not too hot or too cold.

vi) Children usually have a very high taste sensitivity. They do not enjoy highly flavoured foods. Only mildly flavoured foods should be included in the diet.

vii) The digestive tract of the preschool child is easily irritated by spicy food, very sweet or fried foods. Hence, such foods should be avoided. Further consuming excessive amounts of fibrous food also irritates the tender digestive tract. It is, therefore, advisable to use a minimum of fibre-rich foods for preschool children.

viii) Preschool children are almost constantly active. Their interest is readily diverted from food. Hence, it is essential to prepare meals that look colourful, attractive and catch the attention of the child and motivate them to eat.
ix) It is important that the child eats a good breakfast. Breakfast should supply up to one-third of the day's energy requirement. A good nutritious breakfast served in the morning would help increase physical and mental efficiency of the child.

Simple tips on how to provide adequate and satisfying meals for preschoolers are listed below in points to remember.

<table>
<thead>
<tr>
<th>POINTS TO REMEMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preschool Child</td>
</tr>
<tr>
<td><strong>DO'S</strong></td>
</tr>
<tr>
<td>1) Include foods rich in energy and protein</td>
</tr>
<tr>
<td>2) Serve more milk, green leafy vegetables, carrots, mango, papaya and other vitamin A rich foods to the child</td>
</tr>
<tr>
<td>3) Ensure that the meal time for the child is relaxing</td>
</tr>
<tr>
<td>4) Serve small bite-sized or finger sized pieces of food to the child</td>
</tr>
<tr>
<td>5) Introduce a variety of foods in the child's diet</td>
</tr>
<tr>
<td>6) Serve small but frequent meals</td>
</tr>
<tr>
<td>7) Include nutritious snacks in-between meals</td>
</tr>
<tr>
<td>8) Prepare meals according to the likes/dislikes of the child</td>
</tr>
<tr>
<td>9) Provide more food than the usual intakes, after the child recovers from an illness</td>
</tr>
<tr>
<td>10) Encourage the child to sit and eat</td>
</tr>
<tr>
<td><strong>DON'TS</strong></td>
</tr>
<tr>
<td>1) Do not restrict the food intake when the child is ill</td>
</tr>
<tr>
<td>2) Never use food as a means of reward or punishment</td>
</tr>
<tr>
<td>3) Do not serve snacks close to meal time</td>
</tr>
<tr>
<td>4) Never force the child to eat</td>
</tr>
<tr>
<td>5) Avoid serving too hot or too cold foods</td>
</tr>
<tr>
<td>6) Discourage the child from eating sweet, sticky foods and food preparations</td>
</tr>
<tr>
<td>7) Avoid highly flavoured or spicy foods</td>
</tr>
</tbody>
</table>

NOTE: REFER TO THE PRACTICAL MANUAL — PART I (SECTION 6) FOR DIETS FOR INFANTS AND PRESCHOOLERS.
Check Your Progress Exercise 5

1) State whether the following statements are true or false. Give reasons for your answers.

a) When supplementary feeding has been delayed, the child does not accept food easily at one year of age. (True/False)

b) Small frequent meals should not be given to the preschooler. (True/False)

c) Fibre rich food like whole grain cereals, whole pulses should be totally avoided for older preschool children. (True/False)

d) Foods disliked by preschoolers should be avoided. (True/False)

e) At each meal, large helpings of food should be given. (True/False)

2) List any three specific considerations that should be kept in mind while feeding preschoolers.

9.4 LET US SUM UP

In this unit you studied about infancy and the preschool stages.

Infancy refers to the first year of life after birth. Infancy is a period of rapid growth and development. To support the growth and development the nutritional needs are considerable. The RDI for energy, protein, calcium and iron are particularly high. The nutrient requirement of the infant for the first six months can be easily met by breast milk. After six months however, breast milk alone is not sufficient to meet the growing needs of the infant. Along with breast milk other food supplements (liquid, semi-solid, solid) need to be given according to the age of the infant. By the age of one year the infant should be ready to eat the family food.

Preschool stage i.e. 1-6 years, is also a rapid growth period. But compared to infancy the growth is gradual and slow. The most characteristic feature of the preschool age, however, is the increase in physical activity of the child. Because of the rapid growth and increased physical activity, the nutrient requirement is high. To meet the nutrient requirement of preschoolers, certain dietary considerations should be kept in mind. First, the meal should be balanced and nutritionally adequate. Regularity in the feeding schedule should be maintained. Since the child cannot eat much at a time, small but frequent meals should be given. Substantial snacks should be offered in between the main meals — mid-morning or in the evening. Strongly flavoured or fatty foods should be avoided. Meals served should be attractive and appealing to the eye so that the child is motivated to eat.
9.5 GLOSSARY

**Food Allergy**: It is the condition when the body reacts unfavourably to milk or other food substances. Allergy might manifest itself in the form of diarrhoea, skin rash or any other such problems.

**Malnutrition**: It can be defined as a pathological state resulting from relative or absolute deficiency or excess of one or more essential nutrient, which can manifest into overnutrition or undernutrition.

**Staple foods**: The foods used frequently or daily in meal preparation. For example rice is the staple food in south, and wheat is the staple food in north.

**Subnormal growth**: It refers to below normal growth, for example when the height/weight of an individual is considerably lower as compared to other individual of the same age it is referred to as subnormal growth.

**Vulnerable**: Refer to someone capable of being physically/emotionally hurt; Susceptible to infections/diseases.

**Weaning**: The gradual change in the infants diet pattern from breast milk to other liquid food preparation and cooked solid-food preparation is referred to as weaning.

9.6 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

**Check Your Progress Exercise 1**

1) a) birth; one b) doubles c) weight, height d) any two of the following — energy/protein/calcium/vitamin A e) size; number

2) a) True; the RDIs for some nutrients are expressed per kg body weight because their requirement is substantially different within the specific age category.

   b) False; the requirement for iron is high during infancy because the blood volume increases and, therefore, iron is required for the synthesis of haemoglobin in the blood cells.

   c) False; an infant should be weighed every month during the first year, to assess the pattern of growth.

   d) False; an infant gains comparatively more in weight than in height.

   e) True; the RDIs for the first six months are only guidelines for feeding infants who cannot receive breast milk. If an infant who is breast fed, on an average, receives 850 ml milk/day his RDIs are easily met.

**Check Your Progress Exercise 2**

1) a) Breast milk is nutritionally adequate as it contains all nutrients in the right amount and proportion. The protein content of breast milk, as compared to other milks, is low, but it is the right amount for the infants growth. The carbohydrates and the essential fatty acids content of breast milk is high which is beneficial for the child.

   b) Breast milk contains certain substances which are protein in nature and protect the infant's body from infections and diseases. These substances thus prolong the body immunity.

   c) Colostrum is life-saving as it has protective functions. It contains high concentration of antibodies and white blood cells which protects the child from infections.

**Check Your Progress Exercise 3**

1) The process of introducing foods other than breast milk (liquid foods, other substitute milk preparation, cooked solid food) in the diet of the infant is called supplementary feeding.
2) (a) 4-6 (b) Well cooked; mashed (c) crunchy; lumpy (d) small, frequent (e) breastfeeding (f) cow's

3) Answer on your own.

Check Your Progress Exercise 4
1) (a) one: six (b) slow, gradual (c) physical (d) any two of the following — energy/ protein/vitamin A/ calcium (e) length; weight (f) 2-2.5

Check Your Progress Exercise 5
1) a) True; because the child is not familiar with the food and has not developed a taste for it.
   b) False; small frequent meals should be given to the preschoolers since, the child may not be able to eat much at one time.
   c) False; fiber-rich foods should be served judiciously since high fibre diet would irritate the digestive system of the child.
   d) False; foods disliked by the children should not be avoided infact they could be served by changing the form of food.
   e) False; small amounts of food should be served at each meal since the capacity of the child's stomach is small and he cannot eat much at one time.

2) List any three of the following:
   • Regularity in the feeding schedule should be maintained.
   • Small frequent feeding should be given.
   • All fried, spicy and strongly flavoured foods should be avoided, whilst the fibrous food should be reduced.
   • Serve more milk, green leafy vegetables, yellow and orange fruits and vegetables and other vitamin A rich foods to the child.
   • Include nutritious snacks in-between meals.