# 5 Nutritional and Food Requirements for School Children — 6 to 12 Years

The school-age period has been called the latent time of growth. The rate of growth slows and body changes occur gradually. Girls usually out distance boys by the latter part of this period.

The slowed rate of growth during this period results in a gradual decline in the food requirement per unit of body weight.

## NUTRITIONAL REQUIREMENTS

The RDA of school children aged 6–12 years suggested by ICMR is given in Table 5.1.

**Table 5.1 ICMR Recommended Dietary Allowances for children 6-12 years – 2010**

| Nutrient | Years | | |
|---|---|---|---|
| | 7–9 | 10–12 | |
| | | Boys | Girls |
| Body weight kg | 25.1 | 34.3 | 35 |
| Energy kcal | 1690 | 2190 | 2010 |
| Protein g | 29.5 | 39.9 | 40.4 |
| Visible fat g | 30 | 35 | 35 |
| Calcium mg | 600 | 800 | 800 |
| Iron mg | 16 | 21 | 27 |
| Vitamin A | | | |
| Retinol μg | 600 | 600 | 600 |
| β-carotene μg | 4800 | 4800 | 4800 |
| Thiamine mg | 0.8 | 1.1 | 1.0 |
| Riboflavin mg | 1.0 | 1.3 | 1.2 |
| Niacin equivalent mg | 13 | 15 | 13 |
| Pyridoxine mg | 1.6 | 1.6 | 1.6 |
| Ascorbic acid mg | 40 | 40 | 40 |
| Dietary folate μg | 120 | 140 | 140 |
| Vitamin $B_{12}$ μg | 0.2–1.0 | 0.2–1.0 | 0.2–1.0 |
| Magnesium mg | 100 | 120 | 160 |
| Zinc mg | 8 | 9 | 9 |

Nutritional requirements of boys and girls are more or less the same till the first 9 years. After that, there is a variation in some nutrients.

## Calories and Protein

Energy needs vary with the child's growth rate, body size and physical activity. To be healthy, children need to be engaged moderately in intense physical activity at least for one hour per day. This fact is taken into consideration by the Expert Committee (2010) in prescribing the energy needs of children. Body requirements of calories are increased steadily for this age group. Requirements for boys and girls for energy are increased from 7–9 to 10–12 years as there is gradual increase in need because reserves are being laid down for the demands of the approaching adolescent period. Younger school-age children (7–9 years old) require more energy per kilogram of body weight (67 kcal) compared to 10–12 years old (60 kcal). The increased requirements of protein would meet demands of growth. Girls require more protein between 10–12 years than boys for approaching menarche. In children protein energy ratio is low owing to the high energy needs.

For school children aged 6–10, Protein Energy ratio of requirement is 5.1. If sedentary then the PE ratio increases to 5.9. Protein requirement is constant at different levels of activity, while the energy requirement changes, the PE ratio becomes higher.

## Fat

Total fat intake below 25% E is considered to affect growth in children. To provide 25 per cent total fat calories, a minimum level of visible fat in children should range between 25–35 g/day.

## Minerals

**Calcium:** Ten to twelve-year old children require 600–800 mg of calcium and 600–800 mg of phosphorus to meet skeletal growth demands. They need to take 2–3 glasses of milk to meet the requirement of calcium.

**Iron:** In childhood, the mean increase in body weight is 2.8 kg/y, which necessitates an iron requirement of 0.7 mg/d. The average iron requirement for growth would be about 17 µg/kg/d. During childhood (4 to 9 + 4) body store of iron builds up to 5 mg/kg, which is maintained in girls until menarche. The requirements of iron for 10-12 year old girls is 27 mg and for boys 21 mg.

Iron deficiency anaemia is a risk factor for poor educational performance in school-age children.

**Iodine:** Figure 5.2 shows percentage prevalence of IDD in 6–12 year old children. The incidence of IDD is high in the States of Maharashtra and West Bengal.

**Fig. 5.1 Children aged 7–12 should take 2–3 glasses of milk per day to improve their bone density.**

## Vitamins

Vitamin A requirements of the children have been computed from the requirement figures for infants (50 µg/kg) and adults 9.3 µg/kg taking into account growth rates at different ages. The RDA of vitamin A and C are same as adult RDA. B-vitamin requirements are in proportion to calorie requirements.

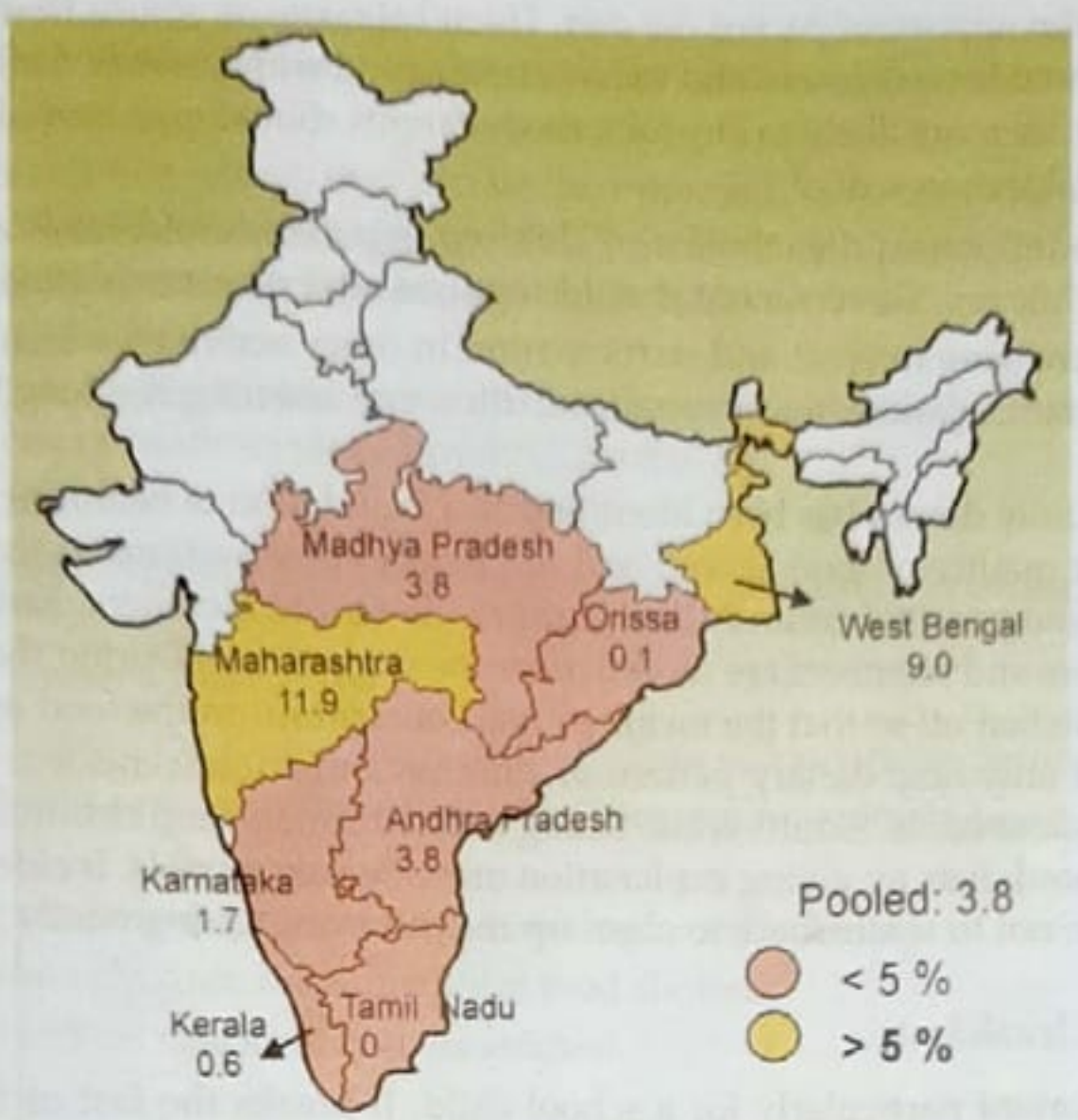


**Fig. 5.2 Prevalence (%) of IDD among 6 -< 12 year children**

*Source* : Annual report, 2003-04, National Institute of Nutrition, Hyderabad

### Fibre

The American Health Foundation recommends fibre for children and adolescents aged 3 to 20 years. The requirement of fibre is the age of the child plus 5 g dietary fibre. For example, if the age of the child is 6, the requirement of fibre is 6 + 5 = 11 g. No recommendations are made by the expert group for Indian children.

Leaf nutrient concentrate from different green leafy vegetables has been standardised by NIN (2009-2010). This concentrate can be fed to children whose micronutrients requirements are high.

## FOOD REQUIREMENTS

The school age period is one of steady growth, usually with fewer feeding problems than during toddler and preschool years. A natural increase in appetite is responsible for an increase in food consumption. The child's growing independence leads to a gradual transfer of control of food selection from the parent to the child.

Parents or caretakers should provide nutrition education for their children as being role models. Parents should encourage the child to eat appropriate portion size, eating a variety of foods and trying new foods. Negative behaviours such as using food as an emotional coping mechanism or as a reward, should be discouraged.

Between the ages of 8 to 11, some girls may be at risk for developing eating disorders.

# Nutritional and Food Requirements for Preschool Children—1 to 6 Years

The years between 1 and 6, growth is generally slower than in the first year of life but continues gradually. The child may gain in weight 150–200 g per month between one and two years. Activity also increases markedly during the second year of life as the child becomes increasingly mobile. Development of a full dentition by about the age of 2 years also increases the range of foods that can safely be eaten. There is an increased need for all nutrients, but the pattern of increase varies for different nutrients in relation to their role in growth of specific tissues.

## NUTRITIONAL REQUIREMENTS

### Energy

The RDA suggested by ICMR in 2010 reduced from the earlier recommendations the energy requirement of children aged 1-2 years by 7 percent to fit with energy requirement of infants. Energy is required for growth and activity. Insufficient food will not only result in undernutrition in terms of inadequate weight gain but will also hinder growth. The rate of growth fluctuates from one age to another. Up to 10 years of age there is no difference in sex for RDA. Due to improper weaning practices, the child may not meet calorie and protein requirement leading to Protein Energy Malnutrition. Insufficient calorie intake can lead to protein deficiency.

### Protein

The increase in the muscle mass that must accompany bone growth requires positive nitrogen balance that is met by protein intake of 1.3 g/kg body weight. The increase in total body size necessitates a larger vascular system to transport nutrients to the tissues and waste all products away from the tissues. Thus there is an increase in demand for nutrients needed in blood formation like protein, iron, folacin and pyridoxine. Bone growth also creates a need for protein.

The RDA of preschool children (1–6 years) is given in Table 4.1.

### Fat and Essential Fatty Acids

Fat energy including invisible fat for children should be 25 per cent of total energy. To provide 25 per cent fat calories, the minimum level of visible fat in the diet of children should range between 25–27 g/day.

In childhood, the mean increase in body weight is 2.8 kg/year, which necessitates an iron requirement of 0.7 mg/d. The average iron requirment for growth would be about 17 µg/kg/d. During childhood (4–9 + y) body store of iron builds up to 5 mg/kg which is maintained in girls until meuarche.

## Calcium

Calcium requirements of children is calculated on the basis of the amount of calcium accretion in the body. This deposition is not uniform throughout growing period, but would be relatively greater during early childhood and during adolescence than during the other periods of growth. Since, all dietary calcium is not absorbed 600 mg/day is prescribed though the actual requirement may be less. The RDA of phosphorus is 600 mg/day. Deficiency of calcium can affect the bones of growing children. Milk is the best source of calcium. Hence the diet of preschool child should include 1–2 glasses of milk per day.

**Table 4.1 ICMR Recommended Dietary Allowances for pre-school children–2010**

| Nutrient | | Years | |
|---|---|---|---|
| | | 1–3 | 4–6 |
| Body weight | kg | 12.9 | 18.0 |
| Energy | kcal | 1060 | 1350 |
| Protein | g | 16.7 | 20.1 |
| Visible fat | g | 27 | 25 |
| Calcium | mg | 600 | 600 |
| Iron | mg | 9 | 13 |
| Vitamin A | | | |
| Retinol | µg | 400 | 400 |
| β carotene | µg | 3200 | 3200 |
| Thiamine | mg | 0.5 | 0.7 |
| Riboflavin | mg | 0.6 | 0.8 |
| Niacin equivalent | mg | 8 | 11 |
| Pyridoxine | mg | 0.9 | 0.9 |
| Ascorbic acid | mg | 40 | 40 |
| Dietary folate | µg | 80 | 100 |
| Vitamin $B_{12}$ | µg | 0.2–1.0 | 0.2–1.0 |
| Magnesium | mg | 50 | 70 |
| Zinc | mg | 5 | 7 |

## Iron

During growth, for an increase in each kilogram in body weight 30 mg of iron is required and since the increase in body weight during childhood is 2 kg/year on an average, the daily requirement of iron for growth will be 0.2 mg. The physiological requirement can vary markedly for 1–2 years from 0.2–0.5 mg per kg of body weight per day.

Within the first year of life the full term infant almost doubles its total iron content and triples its body weight. The change in body iron during this period occurs mainly between 6–12 months of age. Between 1 and 6 years of age, the body iron content is again doubled. The absorbed iron requirements in infants and children are very high in relation to their energy requirements. For example in infants 6–12 months of age about 1.5 mg iron must be absorbed per 1000 kcal and about half of this amount up to the age of 4 years.

## Vitamin A

Vitamin A requirements of children have been computed from the requirement figures of infants (50 μg/kg) and adults (9.3 μg/kg) taking into account growth rates at different ages. The incidence of vitamin A deficiency signs are high and serum vitamin A levels are generally low among Indian children whose dietary intake is less than 100 μg. According to the studies conducted by ICMR, children receiving food supplements which provided a total of 300 μg of vitamin A per day over a period of 6 months, serum vitamin A levels were found to be around 30 mg/dl and no clinical signs of vitamin A deficiency. Based on this data 400 μg have been suggested including the safety allowances. Deficiency of vitamin A in children can cause Bitot's spots, night blindness or in severe cases total blindness also. Milk, eggs, carrots and green leafy vegetables should be included in the diet.

## B Vitamins

The daily allowances of B-vitamin requirements are based on energy intake. The allowances per 1000 kcals are (same as an adult) 0.5 mg thiamine, 0.6 mg riboflavin and 6.6 mg niacin equivalents. Dietary folate requirement for 1–3 and 4–6 year old is 80 and 100 μg/d respectively.

## Vitamin D

Vitamin D is now considered more as a pro-hormone than as a vitmins. It can be synthesised in the body in adequate amounts by simple exposure to bright sunlight even for 5 min per day. Habitual Indian diets do not provide even 10 per cent of the requirement.

The expert committee suggested that outdoor physical activity is a means of achieving adeqate vitamin D status.

## Infections and Nutritional Status

Nearly two out of three preschool children in India are malnourished. Incidence of PEM and vitamin A deficiency are high among this age group.

Growth is influenced by nutrition. Frequent attacks of infectious diseases affect their growth and increase the requirements of various nutrients.

Repeated illnesses—especially the common illnesses such as diarrhoea, measles, whooping cough and other respiratory infections—are the principal underlying causes of malnutrition. They take away appetite and so reduce food intake often for many days each month, they inhibit the absorption of the food that is eaten, they drain the body of nutrients through diarrhoea and vomiting, they burn up calories in fever. The result is frequent weight loss.

The mechanisms by which infections worsen nutritional status are anorexia, malabsorption, catabolic losses, fever, additional intestinal losses, reduced growth, weight loss and above all superstitious and improper methods used during infection.