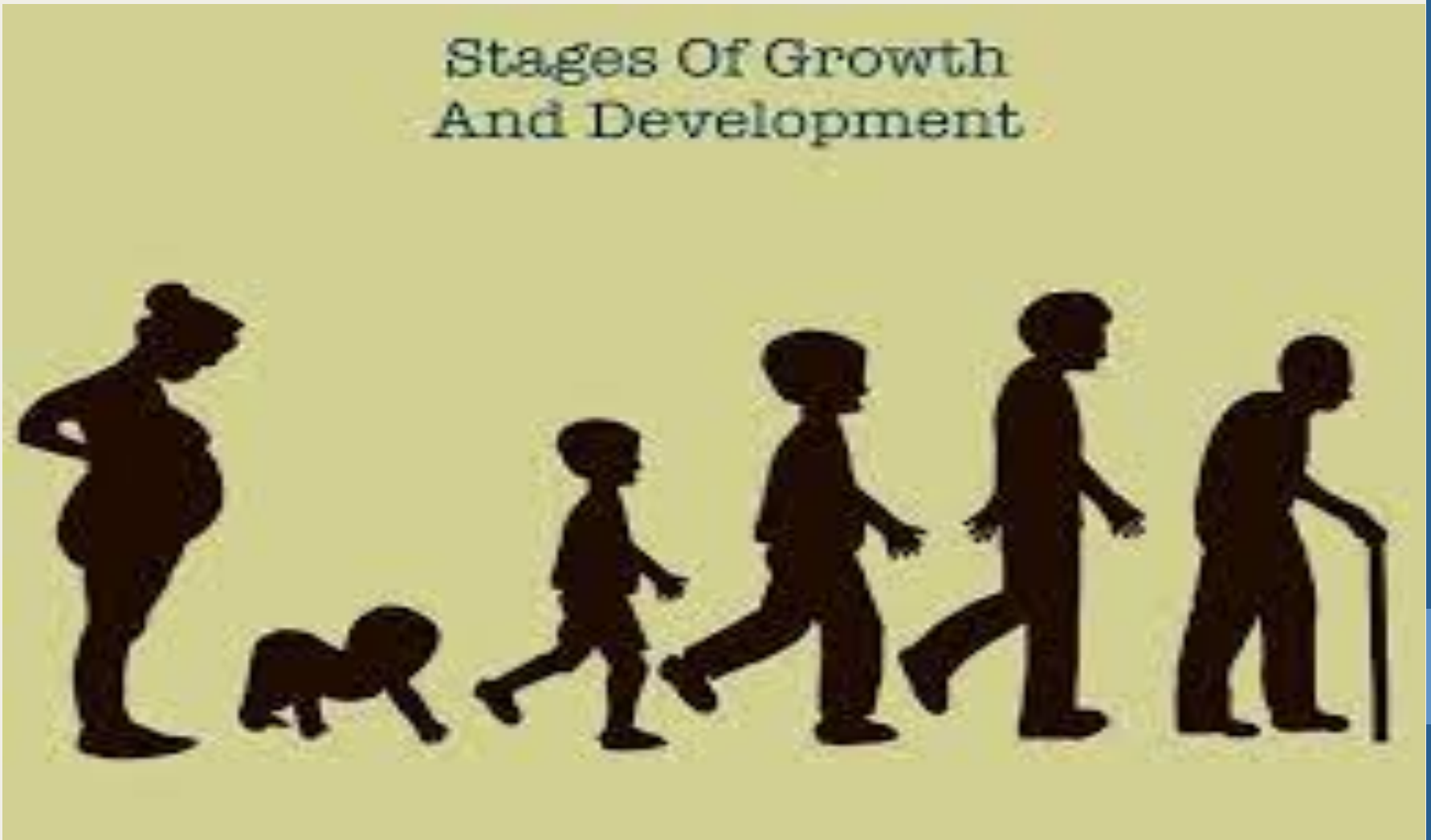
DIET FOR GROWTH & DEVELOPMENT



Normal growth pattern

- The normal cycle of life follows four different stages of growth and development. These stages are:

1. Infancy (0 - 1 year)
2. Childhood (2-11 year)
3. Adolescence (12 -18 year)
4. Adulthood (19 year - death)

How growth pattern varies

- Infancy: This is the very first phase of rapid growth from day one to one year of infant's life. At the age of 6 months, the infant would have doubled the birth weight and by the end of one year, it would have tripled
- Childhood: This is the period between infancy and adolescence, which is marked by a relaxed and often erratic range of growth. There is an occasional increase in growth. At times the child may have great appetite, while on other occasions, he shows no appetite.

How growth pattern varies

- Adolescence: This is the second period of rapid growth that begins with the onset of puberty. Accelerated by hormones, there is a multiplicity of body changes which include growth of long bones, development of sex characteristics and the growth of fat and muscle tissue
- Adulthood: This is the final stage of development where in growth almost stops and then is followed by a gradual decline into old age

Why is it necessary to treat diet for children separately from that of adults?

Although the nutritional needs of children are similar to those of the adults, i.e. energy, protein, mineral elements and vitamins, yet they differ from those of adults in three main respects.

(i) Their energy requirement per unit of weight is higher than that of adults.

(ii) Their food should contain a higher proportion of tissue-building materials, namely proteins and mineral elements as well as of vitamins, than that of adults.

(iii) Their diet should be made up of foods which are suitable to the digestive abilities of any given age, and the scope of the foods that can be readily handled should increase as the child grows older.

Infancy

- This phase of super-fast growth calls for special support on the following five counts:

1. Energy
2. Protein
3. Water
4. Vitamins and Minerals
5. Milk

Infancy

Energy

- Since an infant grows rapidly in the first year, hence his energy requirements are also very high. The FAO/WHO had recommended the followings

Energy allowance for infants	Kcal/kg
0-3 months	120
3-5 months	115
6-8 months	110
9-11 months	105

- The quantity of breast milk needed to meet these energy levels would be 850 ml up to first 3 months and 1200 ml between 3-6 months of age.

Infancy

Protein

- Rapid growth in infancy demands higher intakes of proteins. These have got to be simple, easily digestible proteins foods (fluids). And this is ideally supplied by the breast milk. The ICMR recommends, the following protein allowances for the infants.
- Beyond 6 months, liquid or mashed foods and vegetables must be given to supplement the breast milk

Age in months	Protein allowances/day, g/kg
0-3	2.3
3-6	1.8
7-9	1.8
10-12	1.5

Infancy

Water

- Infant's relative need for water is greater than that of adults. Infant's body content of water is from 70-75% of the total body weight. And most of this water is outside the cells and hence easily lost. Generally, an infant drinks an amount of water equivalent to 10-15% of body weight
- The approximate daily fluid needs are shown here:

Age in months	Fluid need, ml/kg
0-3	120
4-6	115
7-12	100

Infancy

Minerals and Vitamins

- Rapidly growing young bones require calcium and phosphorus.
- Calcium is also needed for teeth formation, muscle contraction, blood coagulation and heart muscle action. The calcium content of the breast milk varies from 30 mg to 40 mg/100 ml. That way up to 6 months of age.
- Iron is needed for hemoglobin formation. Infants require 1mg/kg of iron.

Childhood (2-11 years)

- Childhood may be divided into three phases

i. Toddlers, 1-3 years

ii. Preschool, 3-6 years

iii. School age, 6-11 years

Toddlers (1-3 years)

Energy requirements

- The relative slowing of growth rate means not-so-high demand for calories, as is the case in the first year of growth.
- The child needs about 1000 kcal every day, which gradually goes up to 1300-1500 kcal by the age of three
- The energy requirement is met mainly through increase in cereals and carbohydrate, so that proteins are spared for more vital tissue building jobs

Toddlers (1-3 years)

Proteins

- There is relatively greater need for proteins during childhood
- It should be 1.2 g/kg of body weight
- At least half of these proteins should be of animal origin since they have higher biological value

Minerals

- Calcium and phosphorus are needed for bone mineralization
- Adequate supply of minerals helps strengthen the bones to keep pace with muscle development
- The RDA for calcium is 400-500 mg/day and that of iron is 0.65 mg/day

Pre-school children

- The physical growth in this age group takes place in spurts
- Their protein requirements is very high – 24g/ day of high quality proteins from milk, eggs, meat and cheese.
- Calcium and iron is needed for reserve storage.
- Fresh fruits and vegetables supply the necessary vitamins A and C needed for optimum growth

School-age children

- The 6-11 years age group is the latent period of growth
- During this period the child's growth is not rapid but continues gradually
- Boys and girls have to build up resources for the adolescent period that lies ahead of them, the period in which growth of every tissue is very rapid
- The requirement of food per unit of body weight is less. Eating of snacks, especially in the midafternoon, becomes increasingly common

Adolescent (12 to 18 years age)

- The adolescent period is characterized by the onset of puberty which is the final growth spurt of childhood
- There are profound changes in body due to hormones regulating the development of sex characteristics. There is fluctuations in development between boys and girls leading to to wide differences in metabolic rates, requirement of food and in scholastic capacity
- In the girls, the amount of subcutaneous fat deposit increases more so in the abdominal region
- The hip breath increases and the bony pelvis widens considerably in preparation of the reproductive phase that follows later.
- In the boys, there is increased muscle mass and growth of long bones, although its growth rate is slower than that of girls

Adolescent (12 to 18 years age)

Nutritional requirements

- The stage adolescence demands more energy, proteins, vitamins and minerals
- The girls need 1800-2500 kcal energy per day, as against boy's requirement of 2500-3500 kcal/day
- The need for calcium and iron to support bone and muscle growth continues. In the case of girls, menstrual iron losses may cause iron-deficiency anemia.
- Since the rate of metabolism is high, the need for iodine is also increased
- The B vitamins are required in greater amounts by boys than girls to meet their extra energy demands of energy and muscle tissue development

Adulthood (aging and the aged)

- Adulthood and the old age are the last phases of a normal life-cycle. The aging process continues throughout life. Although physical growth is completed by early adulthood, the body tissues and cells remain in a dynamic state, with catabolism slightly exceeding anabolism
- As a person grows older his organs show reduced ability to perform physiological functions. This is because there is cells loss and reduced cell metabolism. For example blood flow through kidney is reduced by 65%.

Nutritional requirement of Adults

- Energy: the requirement of calories decreases with advancing age steadily after the growth spurt seen on adolescence. This is because the basal metabolism of adult is reduced, accompanied by decrease in his physical activities. The adequate calorie requirement is the one considered to maintain his normal weight.
- Carbohydrate: since calorie requirement is low, intake of CHO, especially simple sugars should be limited. Consumption of complex CHO such as whole grain cereals, potatoes and dried legumes in the diet are encouraged (40-50% 0f total requirement)
- Fats: it is necessary to consume fats comprising 10-15% of the total calorie intake. Serum cholesterol increase after the age of 50 years. Therefore foods containing high levels of cholesterol such ad egg yolk, whole milk, organ meats etc should be avoided

Proteins The rate of protein synthesis decreases every year as age advances. No new tissue is formed except that there is maintenance of worn out tissues. The requirement for dietary protien decreases by about 30 percent. It is necessary to supply protein at about 15–20 percent of the caloric requirement. This applies to people who have good health and do not suffer from any problems. Older persons suffering from gastro-intestinal problems, infection or changed metabolic efficiency as a result of disease or medication should increasetheir protein intake appropriately.

Vitamins The requirement for these is similar as for adults. However, due to the normal aging process the ability to store fat-soluble vitamins decreases. The problem of vitamin deficiency in the old may stem from inadequate intake rather than from increased need. The need for the fat-soluble vitamins especially A and D may be met easily through the diet but their absorption and storage may be hampered due to lack of dietary fat, inadequate bile secretion, use of laxatives and antibiotics, and/or pancreatic insufficiency.

Special attention needs to be given to vitamin D since bone decalcification is very common in the later years. If its requirement is not met through the diet, supplements may have to be given. Other fat-soluble vitamins may be supplied through diet.

Older adults may require supplementation of B vitamins especially thiamine, pyridoxine, cyanocobalamin, and folic acid because their daily food

intake is decreased, hence the decreased intake of dietary vitamins. The increased needs for these vitamins may be due to less efficient absorption or altered metabolism and excretion resulting not only from physiological change but also from certain medications.

Minerals Special attention needs to be given to two minerals, iron and calcium, since these may be lacking in poor diets and may need to be supplemented. The requirement of iron for women may be higher than that of men until they attain menopause. But after completion of menopause their requirement for iron is similar to that of men.

Absorption of calcium decreases with age, resulting in osteoporosis and fragile bones which fracture easily. Calcium is also important for maintaining health of the oral tissues.