Chapter 6 Family Meal Management

Learning Objectives

- To provide an indepth understanding of meal management for people of different age groups.
- To provide a body of knowledge relevant to the study of the role of nutrition throughout the lifecycle.
- To provide an understanding about the link between nutritional needs and nutrition related problems
- To identify and overcome obstacles in the provision of healthy diets for specific age groups.

G4BHV3

6.1 INTRODUCTION

In recent times, food has emerged as a source of comfort and a potential threat to health. It reflects cultural heritage and gives a feeling of security and pleasure. Healthy food intake is an important

Important terminologies

Health: Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 1948).

Nutrient requirement: It is defined as the minimum amount of the absorbed nutrient that is necessary for maintaining the normal physiological functions of the body.

Calorie: A calorie is the energy it takes to raise the temperature of I gram of water to 1 degree Celsius.

Basal Metabolic Rate (BMR): The amount of energy expended daily when the body is at complete rest.

Dietary Fibre: Dietary fibre delays the intestinal transit of the food consumed. Dietary fibre is important for proper bowel function, to reduce chronic constipation, diverticular disease, haemorrhoids, coronary heart diseases, diabetes and obesity. They protect against colon cancer.

Antioxidants: Antioxidants restrict the damage that reactive oxygen free radicals can cause cellular components. They are of primary biological value in giving protection from certain diseases. Raw and fresh vegetables like green leafy vegetables, carrots and fresh fruits including citrus fruits and tomatoes have been identified as good sources of antioxidants.

part of life. Hence, it is very essential to gain knowledge about food, its planning, preparation and service. Creative meal management for people at different age groups can add pleasure and satisfaction to their lives and ensure healthy living.

Vegans eat no foods of animal origin

6.1.1 Balanced Diet

A balanced diet is one which provides all the nutrients in required amounts and proper proportions so that the need for calories, proteins, minerals, vitamins and other nutrients are adequately met. It can be easily achieved through a blend of four basic food groups. The nutrient requirements vary with age, gender, physiological status and physical activity. A balanced diet provides **(i)** 50-60% of total calories from carbohydrates, **(ii)** about 10-15% from proteins **(iii)** and 20-30% from both visible and invisible fat. In addition, a balanced diet should provide other non-nutrients such as dietary fiber, antioxidants and phytochemicals.

6.1.2 Recommended Dietary Allowance (RDA)

The Recommended Dietary Allowances (RDA) presented are in estimates of nutrients to be consumed daily to ensure that the requirements of all individuals in a given population are met. The

recommended levels depend upon the bio availability of nutrients from a given diet. The term bio availability indicates what is absorbed and utilised by the body. In addition RDA includes a margin of safety, to cover variation between individuals, dietary traditions and practices. The RDAs are suggested for all age groups such as infants, pre-schoolers, children, adolescents, pregnant women, lactating mothers and adult men and women taking into account their physical activity. The RDA of an individual depends upon various factors which are as follows:

1. ***Age:*** Adults require more total calories than a child, whereas a growing child requires more calories per kg of body weight than an adult.
2. ***Sex:*** Males with high Basal Metabolic Rate (BMR) require more calories than females.
3. ***Activity:*** The type of activity also determines the energy requirements. The activities are classified as sedentary, moderate and heavy based on the occupation of an individual as given in the table 1 below
4. ***Physiological: Stress*** Nutrient requirements are increased in conditions of physiological stress such as pregnancy and lactation.

6.1.3 Steps in Planning Balanced Diets or Menu Using Food Guide Pyramid and Exchange Lists

Menu planning is the process of planning and scheduling intake of meals for general or specific individual requirements. The four food groups suggested by ICMR given in unit-III (Food Science), permits an individual to plan a menu to achieve nutrient intake as specified by recommended dietary allowances. There are certain principles in planning menus. They are:

1. A good menu plan should meet the nutritional requirements of each member of the family.
2. Meal pattern must fulfill family needs.
3. Meal planning should save time and energy.
4. Meal planning should satisfy the budget of the family.
5. Meal plan should give maximum nutrients.

Table 1 Classification of Activity

	Activity		
Sex	**Sedentary**	**Moderate**	**Heavy**
Male	Teacher, Tailor, Barber, Executive, Peon	Fisher man, Basketmaker, Potter, Goldsmith	Stone cutter, Mineworker, Wood cutter
Female	Teacher, Tailor, Executive	House wife, Nurse, Servant maid	Wood cutter

Source: Gopalan C, Sastri B.V, & Balasubramanian S.C (2007)

6. The meal planned should consider individual likes and dislikes.
7. Planned meals should provide variety.
8. Meals should give satiety.
9. Menus should include available foods.

There are three steps involved in planning a menu

Step1: Recommended dietary allowance:

To plan a balanced diet the first step is to know the recommended dietary allowances for different age groups.

Steps in menu planning

1. Recommended dietary allowance
2. Food list
   i. Using ICMR tables
   ii. The Exchange list
3. Meal plan

The Recommended Dietary Allowance for Indians ICMR (2010) is given in the Table 2.

Table 2 Recommended Dietary Allowances for Indians (Macronutrients and Minerals)

Group	Particulars	Body wt. kg	Net Energy Kcal/day	Protein g/day	Visible Fat g/day	Calcium mg/day	Iron mg/day
Man	Sedentary work	60	2320	60	25	600	17
	Moderate work		2730		30		
	Heavy work		3490		40		
Women	Sedentary work	55	1900	55	20	600	21
	Moderate work		2230		25		
	Heavy work		2850		30		
	Pregnant Women		+350	82.2	30	1200	35
	Lactation 0 – 6 months		+600	77.9	30	1200	25
	6 – 12 months		+520	70.2	30		
Infants	0 – 6 months	5.4	92 Kcal/kg/d	1.16 g/kg/d	–	500	46 µg/ kg/day
	6 – 12 months	8.4	80 Kcal/kg/d	1.69 g/kg/d	19		5
Children	1 – 3 years	12.9	1060	16.7	27	600	09
	4 – 6 years	18	1350	20.1	25		13
	7 – 9 years	25.1	1690	29.5	30		16
Boys	10 – 12 years	34.3	2190	39.9	35	800	21
Girls	10 – 12 years	35.0	2010	40.4	35	800	27
Boys	13 – 15 years	47.6	2750	54.3	45	800	32
Girls	13 – 15 years	46.6	2330	51.9	40	800	27
Boys	16 – 17 years	55.4	3020	61.5	50	800	28
Girls	16 – 17 years	52.1	2440	55.5	35	800	26

Source: Dietary guidelines of Indians National Institute of Nutrition, Hyderabad, (2010).

Table 2 cont'd Recommended Dietary Allowances for Indians

Group	Particulars	Vit. A µg/d		Thiamin mg/day	Riboflavin mg/day	Niacin equivalent mg/day	Pyridoxine mg/day	Ascorbic acid mg/day	Dietary folate µg/day	Vit. B_{12} µg/day	Magnesium mg/day	Zinc mg/day
		Retinol	β-carotene									
Man	Sedentary work	600	4800	1.2	1.4	16	2.0	40	200	1	340	12
	Moderate work			1.4	1.6	18						
	Heavy work			1.7	2.1	21						
Women	Sedentary work	600	4800	1	1.1	12	2.0	40	200	1	310	10
	Moderate work			1.1	1.3	14						
	Heavy work			1.4	1.7	16						
	Pregnant Women	800	6400	+0.2	+0.3	+2	2.5	60	500	1.2		
	Lactation											
	0 – 6 months	950	7600	+0.3	+0.4	+4	2.5	80	300	1.5		12
	6 – 12 months			+0.2	+0.3	+3	2.5					
Infants	0 – 6 months	--	--	0.2	0.3	710 µg/kg	0.1	25	25	0.2	30	--
	6 – 12 months	350	2800	0.3	0.4	650 µg/kg	0.4				45	--
Children	1 – 3 years	400	3200	0.5	0.6	8	0.9	40	80	0.2 – 1.0	50	5
	4 – 6 years			0.7	0.8	11	0.9		100		70	7
	7 – 9 years	600	4800	0.8	1.0	13	1.6		120		100	8
Boys	10 – 12 years	600	4800	1.1	1.3	15	1.6	40	140		120	9
Girls	10 – 12 years			1.0	1.2	13	1.6				160	9
Boys	13 – 15 years			1.4	1.6	16	2.0	40	150		165	11
Girls	13 – 15 years			1.2	1.4	14	2.0				210	11
Boys	16 – 17 years			1.5	1.8	17	2.0	40	200		195	12
Girls	16 – 17 years			1.0	1.2	14	2.0				235	12

Source: Dietary guidelines of Indians, National Institute of Nutrition, Hyderabad, (2010).

Step 2: Food list

Food list is the list of quantities of various food groups to be included in the diet so that it is balanced and can meet the RDA. This can be done by:

- Selecting food from all the four food groups.
- Deciding the quantities of the selected as multiples of portion sizes.

Food list can be prepared either by using ICMR tables or exchange lists.

i. Using ICMR tables

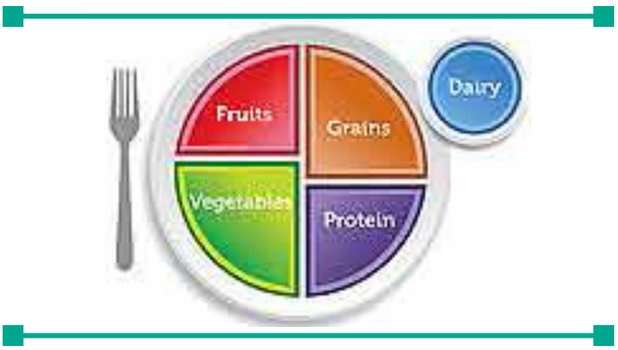
To make menu planning more convenient ICMR has suggested the portion size and balanced diets for adults and for different age groups. The portion sizes are given in terms of raw food.

ii. The Exchange Lists

The Exchange Lists are the basis of a meal planning. Food exchange lists are groups of measured foods of the same calorific value and similar protein, fat and carbohydrate content. All foods of exchange lists make a specific contribution to a good diet. Food exchange lists help in manipulation of protein, calories and other nutrients.

Step 3: Meal plan

The foods that are listed are converted into recipes and distributed in various meals like breakfast, lunch and dinner. My Plate helps individuals to make better food choices and eat healthfully. It illustrates the food groups using a familiar mealtime visual.



▲ Fig 1 My Plate

Table 3 Portion Size And Nutrient Content

Food Groups	Portion G	Energy Kcal	Protein g	Carbohydrate g	Fat g
Cereals and millets	30	100	3.0	20	0.8
Pulses	30	100	6.0	**15**	0.7
Egg	50	85	7.0	-	**7.0**
Meat/chicken or fish	100	100	9	-	**7.0**
Milk(ml) and milk product	100	70	3.0	**5**	**3.0**
Roots and tubers	100	80	1.3	**19**	-
Green leafy vegetables	100	45	3.6	-	**0.4**
Other vegetables	100	30	1.7	-	**0.2**
Fruits	100	40	-	**10**	-
Sugars	5	20	-	**5**	-
Fats and oils	5	45	-	-	**5**

Source: Dietary guidelines for Indians, National Institute of Nutrition, Hyderabad, (2011).

Table 4 Exchange list

Preparation	Quantity of one serving	Calories
1. Cereals		
Uppma	1cup	270
Idli	2nos	150
Dosa	1no.	125
Kichidi	1cup	200
Wheat porridge	1cup	220
2. Pulses		
Plain dhal	½ cup	100
Sambar	1cup	110
3. Vegetables		
With gravy	1cup	170
Dry	1cup	150
4. Non-vegetarian		
Mutton curry	3/4 cup	260
Chicken curry	3/4 cup	240
Keemakofta curry	3/4 cup	240
Fish fried	2 big pieces	190
Prawn curry	3/4 cup	220
5. Savoury snacks		
Bajji or pakora	8 no's	280
Besankapura	1 no.	220
Chat(dahipakori)	5 pieces	220
Samosa	1 no.	200
Masala dosa	1 no.	200
6. Chutneys		
Coconut/ groundnuts/ til	2tbsp	120
Tomato	1tbsp	10
Tamarind(with jiggery)	1tbsp	60
7. Sweets and desserts		
Besanbarfi	2 small pieces	400
Rice puttu	½ cup	280
Halwa (kesari)	½ cup	320
Srikhand	½ cup	380
Sandesh	2 no's	140
8. Beverages		
Tea (2tsp sugar + 50 ml toned milk)	1 cup	75
Coffee(2tsp sugar + 100 ml	1 cup	110
Cow's milk (2 tsp. sugar)	1 cup	180
Lassi (2 tsp. sugar)	1 cup/glass (200ml)	110
Cold drinks	1 bottle (200ml)	150

Source: Dietary Guidelines for Indians - A manual, National Institute of Nutrition, ICMR, Hyderabad, India (2010).

Table 5 Sample Meal Plan for Adult Man (Sedentary)

Meal time	Food group	Raw	Cooked recipe	Serving amounts
Breakfast	Milk	100ml	Milk or	½ cup
			Tea or	2 cups
	Sugar	15g	Coffee	1 cup
	Cereals	70g	Breakfast item	
	Pulses	20g		
Lunch	Cereals	120g	Rice	2 cups
			Pulkas	2 no's
	Pulses	20g	Dhal	½ cup
	Vegetables	150g	Veg-curry	¾ cup
	Milk	100ml	Curd	½ cup
Tea	Cereals	50g	Snack	
	Milk	50ml	Tea	1 cup
	Sugar	10g		
Dinner	Cereals	120g	Rice	2cup
	Pulses	20g	Pulkas	2nos
	Vegetables	150g	Dhal	½ cup
	Milk(curd)	50ml	Vegetables	¾ cup
	Vegetables	50g		
	Fruit	100g	Seasonal	1 medium

Source: Dietary guidelines of Indians, National Institute of Nutrition, Hyderabad, (2010).

Nutrition Portfolio

1. Describe your choices within each food group from day to day and include realistic suggestions for enhancing the variety in your diet.
2. Compare the foods you eat daily using the food guide pyramid and make a note of which food groups are usually over or under represented

Activity 1 Word Scramble

1. *RAEBD ..... A baked product.*
2. *CIER ..... A cereal.*
3. *RPAEGS ..... Fruit used to make wine.*
4. *NEGOAR ..... Fruit rich in vitamin c.*
5. *CMUCPAIS ..... Green pepper.*
6. *JLBARNI ..... A vegetable.*
7. *TYRPLOU ..... meat of domesticated birds*
8. *GRUTOY ..... Milk product*
9. *GAUSR ..... Sweetener*
10. *NDMAOL ..... a nut*

Vegetarians use meat replacements made of textured vegetable protein (soy Protein)

Folic acid is also called pteroylglutamic acid, a deficiency of which results in macrocytic anaemia.

6.2 NUTRITIONAL NEEDS DURING DIFFERENT STATGES OF HUMAN LIFE CYCLE

6.2.1 Nutritional Needs of Infants

Infancy is a period of rapid growth. The development during infancy is more rapid than during at any other period in the life time of an individual.

Growth and Development

The growth and development is accompanied by a number of physiological changes which include changes in body size and body composition, changes in the gastro intestinal system, excretory system and circulatory system. Nutrition is crucial and proper dietary modifications are vital during this period.

Immunization

Malnutrition during infancy leads to a higher incidence of infant mortality. Besides malnutrition,infection causes mortality. Immunization protects the children against disease. Table 6 below presents the immunization schedule for infants and children.

Good nutrition is essential for the growth and development that occurs during an infant's first year of life. As an infant's mouth, tongue, and digestive tract mature, the infant shifts from being able to only suckle, swallow, and take in liquid foods, such as breast milk or infant formula, to

Table 6 National Immunization Schedule (NIS) for Infants, Children

Age	Vaccine
Soon after birth	Hepatitis B 1st dose, OPV 1st dose, BCG
6 weeks	Hepatitis B 2nddose,DPT 1stdose,OPV 2nd dose
10 weeks	DPT 2nddose,OPV 2nd dose
14 weeks	DPT 3rddose,OPV 4th dose
6 weeks, 10 weeks and 14 weeks	OPV 5thdose,Hepatitis B 3rd dose
9 months to 12 months	Measles
15 to 18 months	MMR
16-24 months	DPT, OPV 1st Booster
2 years	Typhoid vaccine
5 – 6 years	DPT, OPV 2nd Booster

DPT- Diphtheria, Pertussis, And Tetanus: OPV-Oral Polio Vaccine; MMR- Measles, mumps, and rubella

Source: https://mohfw.gov.in/sites/default/files/24545352106148966387 3.pdf

being able to chew and receive a wide variety of complementary foods.

Energy: Infants need energy from food for activity, growth, and normal development. Energy comes from foods containing carbohydrate, protein, or fat. A general indicator of infant consuming an adequate kilocalories per day is the infant's growth rate in length, weight, and head circumference.

Carbohydrate

The major type of carbohydrate normally consumed by young infants is lactose, the carbohydrate source in breast milk. Lactose-free infant formulas, such as soy-based infant formulas provide carbohydrates in the form of sucrose. In later infancy, infants derive carbohydrates from additional sources including cereal and other grain products, fruits, and vegetables.

Protein

Breast milk and infant formula contains protein. The complementary foods such as meat, poultry, fish, egg yolks, cheese, yogurt, pulses, cereals and other grain products provide adequate protein.

Fat

Breast milk and infant formula are important sources of lipids, including essential fatty acids, during infancy.

Vitamin A

Breast milk and infant formula are major food sources of vitamin A. Additional sources of vitamin A or carotenes for infants consuming complementary foods include egg yolks, yellow and dark green leafy vegetables and fruits e.g., spinach, greens, sweet potatoes and liver.

Vitamin E

Infants receive vitamin E from breast milk and infant formula. Other vitamin E sources for older infants include green leafy vegetables, vegetable oils and their products, wheat germ, whole-grain breads, cereals and other fortified or enriched grain products, butter, liver, and egg yolks.

Vitamin K

Sources of vitamin K include infant formula, green leafy vegetables, pork, and liver.

Vitamin C

Breast milk and infant formulas are major food sources of vitamin C. Additional vitamin C sources include vegetables (e.g., tomatoes), fruits (e.g., citrus fruits, papaya, and strawberries), and regular fruit and vegetable juices which are naturally high or fortified with vitamin C.

Vitamin B_{12}

An infant's vitamin B_{12} stores at birth generally supply his or her needs for approximately 8 months. Infants consuming appropriate amounts of breast milk from mothers with adequate B_{12} stores or infant formula receive adequate amounts of this vitamin. Complementary foods such as meat, egg yolks, and dairy products provide this vitamin later in infancy as well.

Calcium

An infant can obtain sufficient calcium by consuming adequate amounts of breast milk or infant formula. Older infants can obtain additional calcium from complementary foods such as yogurt, cheese, cottage cheese (paneer), fortified or enriched grain products, some green leafy vegetables (such as turnip and greens), and tofu.

Iron

Sources of iron for infants include breast milk, infant formula, meat, liver legumes, whole-grain breads, cereals, or fortified or enriched grain products, and dark

green vegetables. Heme iron is found primarily in animal tissues, including red meat, liver, poultry and fish and non-heme iron is found in breast milk, infant formula, cereals, or other grain products legumes, fruits and vegetables. Infants receive most of the iron in their diets as non heme iron.

Tofu, or bean curd, is a popular food derived from soya. It is a staple ingredient in Chinese cookery and is a good source of protein, containing all eight essential amino acids. It is also an excellent source of iron and calcium and the minerals manganese, selenium and phosphorous.

Zinc

Infants obtain zinc from breast milk, infant formula, meat, poultry, liver egg yolks, cheese, yogurt, legumes, and whole-grain breads, cereals, and other fortified or enriched grain products.

Sodium

Healthy, full-term infants consuming primarily breast milk or infant formula of standard dilution receive a relatively small amount of sodium but an amount adequate for growth.

Fiber

Breast milk contains no dietary fiber, and infants generally consume no fiber in the first 6 months of life. As complementary foods are introduced to the diet, fiber intake increases. Dietary fiber is found in legumes, whole grain foods, fruits, and vegetables.

Water

Infants' water needs are met from consuming breast milk, infant formula, and complementary foods. Water is also formed in the body in chemical reactions occurring to metabolize protein, fats, and carbohydrates. Under normal circumstances, the water requirements of healthy infants who are fed adequate amounts of breast milk or properly reconstituted infant formula are met by the breast milk or infant formula alone.

6.2.1 Breast Feeding

Infants who are exclusively breast fed for the first 6 months of life grow well and breast feeding is beneficial not only during this period but also during later years of life. The infant is put on the breast within half an hour after a normal delivery. ***American Academy of Paediatrics(2005) firmly adheres to the position that breast-feeding ensures the best possible health as well as the best developmental and psychosocial outcomes for the infants***

Colostrum: During first two or three days colostrum is secreted in small quantities of about 10-40 ml. The composition of colostrum is as follows:

Table 7 Composition of Colostrum

Nutrient	Quantity / 100 ml
Energy (k cal)	58
Fat (g)	2.9
Calcium (mg)	31
Phosphorus (mg)	14
Iron (mg)	0.09
Protein (g)	2.7
Lactose (g)	5.3
Carotene (IU)	186
Vitamin A (IU)	296

Source: Guthrie (1989)

Colostrum contains an interferon like substance which has strong antiviral activity. It contains a B12 binding protein making it unavailable for the growth of ***E-coli*** and other bacteria. It also contains antibodies against viral infection.

Advantages of breast feeding

Breast feeding is the simple and best method of feeding and has the following advantages

1. Nutritional factor

The composition of human milk is best suited for infants. In human milk the protein content is lower but the content of carbohydrate, namely lactose is higher. The fat content is comparatively less. The protein is present as lactalbumin which is better digested than the protein in cow's milk. Lactose provides natural sweetness and also helps in absorption of calcium and iron. Fat though less is highly emulsified and therefore better digested. When compared to animal milk, breast milk provides higher amount of vitamin C. Similarly calcium in breast milk though less when compared to cow's milk is better absorbed by the infant. The composition of human milk is best suited for infants. The table 8 below shows the comparison of Human milk and cow's milk.

2. Hormones and growth factors:

Breast milk is a rich source of hormones like Thyroid Stimulating Hormone (TSH), thyroxin, insulin and prolactin. It also contains growth regulating factors, growth promoters and growth modulators.

Table 8 Comparison Of Human Milk and Cow's Milk

Nutrient per 100 ml	Human milk	Cow's Milk
Water (g)	88	87.5
Energy (k cal)	65	67
Protein (g)	1.1	3.2
Carbohydrate (g)	7.4	4.4
Fat (g)	3.4	4.1
Calcium (mg)	28	120
Phosphorus (mg)	11	90
Iron (mg)	– –	0.2
Carotene (µg)	137	174
Thiamine (mg)	0.02	0.05
Riboflavin (mg)	0.02	0.19
Vitamin C (mg)	3	2
Caseinogen lactalbumin ratio	1.2	3.1

3. Immunological factors:

The following factors in breast milk provide passive immunity.

a. **Macrophages:** They can digest bacteria and also develop immunity against infectious diseases.

b. **Lymphocytes:** Lymphocytes produce antiviral substances like interferon.

c. **Lactoferrin:** It is an iron binding protein that inhibits the growth of *E.coli* and other bacteria.

d. **Enzymes:** Breast milk also supplies enzymes like lipase, amylase and lactoperoxidase which increase digestibility and also destroy the harmful microorganisms.

e. **Immunoglobulin:** They are defensive proteins which include all types of antibodies.

DO YOU KNOW?

August 1-7 is the World Breast Feeding week

4. Economic factors

Breast milk is the most economical food for the baby. Even after accounting the extra food cost required by the mother, breast milk is cheaper than any other type of artificial feed.

5. Psychological factors

Breast feeding is essential for a healthy, happy and emotional relationship between the mother and the infant.

6. Natural contraceptive

Breast feeding prevents the onset of another pregnancy and also prevents breast cancer.

7. Other advantages:

a. Infants jaw is more fully developed.
b. Breast milk is microbiologically sterile.
c. Human milk is always fresh and at the right temperature.
d. It is convenient to administer at any time.
e. Breast fed babies have better cognition and IQ later in life when compared to bottle fed babies.

Artificial feeding

Though breast milk is the best milk and there can be no substitute for it, there are certain circumstances during which the infant needs to be given artificial feeds.

Reasons

1. Illness of short duration like fever, or severe illness like tuberculosis and heart disease.
2. The mother is on steroids, anticoagulants or radioactive drugs.
3. Insufficient milk secretion.
4. Death of mother.

Premature Infants are born before 37 weeks of gestation

Solid food added to an infant's diet is called beikost

6.2.1.2 Complementary Foods and Weaning Foods

Milk provides all the food a baby needs for at least the first four months of life. As babies gain weight and grow older they need a more varied diet. The change over from milk to more solid food is called weaning. The idea of weaning is the process of gradual introduction to a wide range of 'non milk' foods to infants in addition to breast milk. Weaning the baby from breast or bottle feed starts by four months.

Stages of Weaning

Weaning is a transition from breast milk or formula milk to solid foods. It is divided into the following stages:

→ **STAGE I**- Babies are usually ready to start on solid foods between 4-6 months
→ **STAGE II**- 6-9 months
→ **STAGE III**- 9-12 months

Stage I

Babies cannot chew and the first weaning foods need to be similar in consistency to milk. Cereals such as rice or wheat flours mixed with milk is a suitable first weaning food. Food should be the same temperature as their usual milk feed. Mashed, pureed, starchy vegetables made to the same consistency are also suitable foods.

e.g.potato, carrot. Foods should be salted or sweetened. Babies should have 600ml of breast or infant formula milk daily along with the weaning foods.

Stage II

Babies get used to spoon feeding and will take more solid foods. They can begin to have the same foods as the rest of the family, but in mashed or pureed form. They are able to chew foods at six months, so can be given hard foods to chew. These are called finger foods. These include foods such as raw soft fruits and vegetables, raw strips of carrot, cooked green beans and soft banana. Foods with increased quantity, different texture and stronger tastes should be encouraged.

Stage III

At this stage babies will probably eat solid foods in addition to 500-600ml breast milk or infant formula after nine months. Wide variety foods should be given with a range of textures, because the baby can cope up with food that is lumpier in texture.

Important points to be considered while introducing supplementary foods

→ Introduce only one food at a time.
→ Allow the infant to become familiar with the food before trying to give another.
→ Fruit juice should be fed only by cup not by bottle.
→ When the baby is able to chew, gradually substitute finely chopped fruit and vegetables usually at 8 to 9 months.
→ Variety in choice of foods is important.
→ Infants may object to eat some foods by themselves but will take them willingly if one is mixed with another. Egg may be mixed with formula cereal or vegetable.
→ The child can be fed with a spoon until the baby gets used to an adult method of feeding.
→ Give freshly prepared food.
→ Food should be given between breast feeds.
→ The temperature of the food should not be hot or cold.

Supplementary Foods

Foods that are regularly fed to the infant, in addition to breast-milk, providing sufficient nutrients are known as supplementary or complementary foods. These could be liquid foods like milk or semi-solid foods in the case of gruels or porridge or solid preparations like rice, which can be given to children over the age of one year.

Types of Supplementary Foods

Liquid Supplements

→ ***Milk:*** The frequency of breast feeding is reduced to 3 to 4 times a day and cow's milk is substituted in 6 months. Cow's milk is diluted with water in the proportion of 2:1 for the first feed. Sugar can be added to increase taste and calories.
→ ***Juice of Fresh Fruits:*** Small quantities of fresh fruit juices should be given in the 3rd and 4th month of the infant. In early stages fruit juice is diluted with water and only a couple of teaspoons are fed and the amount is gradually increased.
→ ***Soup from Green Leafy Vegetables:*** Green leafy vegetables can be

substituted as an alternative if fruits are not available.

Solid Supplements

Mashed Foods: Mashed food should be given around the 7th and 8th month along with the liquid supplements for the infant.

→ ***Cereal and Starchy Gruels:*** Mashed cereals are rice, wheat and ragi which are usually eaten as porridge with the addition of vegetable oil.

→ ***Vegetables:*** Cooked, mashed vegetables like potato, green leafy vegetables and carrots can be introduced to get vitamins and minerals in the diet.

→ ***Fruits:*** Fruits should be stewed and sieved. Sugar and lime can be added for flavor.

→ ***Non Vegetarian Food:*** Egg yolk is given as good source of protein and it is usually introduced in soft custards. Egg white is not given until the infant is 10 months old, as it causes allergic manifestations. Minced, cooked meat or boiled fish with salt can be given.

CASE STUDY

Case study 1

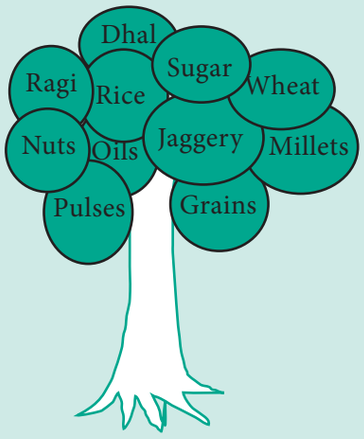
Kavitha has a 6 month year old baby. Outline an appropriate schedule for her to use as a guide for adding solid foods to her baby's diet during the first year of life. What foods are not appropriate at this age?

Activity 2

Guess the nutreints thar are present in the foods listed below

Activity 3

Prepare a weaning food using the following ingredients -



→ ***Pulses:*** Pulses along with cereals in the form of porridge can be given. Pulses and meat preparation can be given alternatively

Unmashed: When the infant starts developing teeth, it is the time to give lumpy foods, cooked cereals and pulses solids like idly, idiappam, bread, chappathi and semi solids like rice and dhal. Vegetables can be chopped and boiled into small pieces. As the child grows, it is better to give fruit segments instead of juice. Fruit provides bulk in the diet and is good for bowel movement.

Problems of Weaning

→ Obesity
→ Underweight
→ Choking
→ Food allergy

6.3 NUTRITIONAL NEEDS OF PRESCHOOL AND SCHOOL GOING CHILDREN

The rapid growth during infancy is followed by a generally slow growth between one to six years. The child becomes more active and the social and environmental influences have a great impact on their food behaviour and eating pattern. The need for nutrients is increased as growth and development continues.

Growth Pattern

During the second year, the increase in height is about 10 cm and weight gain is 2 to 2.5 kg. After two years annual gain in height and weight is only 6 to 7 cm and 1.5 to 2 kg respectively. However, there is a wide variance in the physical development of children.

As growth proceeds, changes occur in a) proportion of water, b) muscle tissue, c) fat deposits and d) skeletal structure. The body water gradually decreases and there is addition of adipose tissue and minerals to the bones.

Nutritional Needs During Preschool

Energy

The energy needs for the child is determined by his basal metabolism and activity. If the preschool child is not given proper complementary foods and supplementary foods, it may lead to protein and energy malnutrition.

Protein

Protein is a vital dietary component for pre-schoolers, as it is needed for optimal growth. Enough protein should be consumed every day for proper growth and development.

Fat

Adequate fat is required to provide the extra calories and reduce bulk in the diet.

Minerals

Calcium is needed for bone and teeth mineralization and maintenance. The amount of calcium a child needs is determined in part by the consumption of other nutrients, such as protein, phosphorus and vitamin D, as well as the child's rate of growth.

Iron requirement during childhood is needed for growth and for increase in the haemoglobin concentration. Dietary lack of iron accompanied by hookworm infestation can lead to anaemia. Zinc is essential for proper development. It is needed for wound healing, proper sense of taste, proper growth, and normal appetite.

30%–50% of aneamia in children and other age groups is caused by iron deficiency (World Health Organization 2007).

Vitamins

The incidence of Vitamin A deficiency is high. The recommended intake for B vitamins is based on the energy intake. The dietary intake of vitamin C for pre-schoolers is the same as for adults i.e., 40 mg/day

Dietary Guidelines

Transition from an infant diet to a regular adult diet should be smooth and gradual. Factors that need to be considered while planning a diet for a preschool child are:

- The food should be interesting and attractive. For example, chapattis, poori and bread slices can be cut into interesting shapes to make eating interesting for a child.
- The diet should include enough quantity and quality of different nutrients. They should be encouraged to have milk every day. Milk can be given with delicious flavours.
- Plenty of fruits and vegetables are needed for proper elimination.
- Fruits are given raw or in the form of simple desserts.

DO YOU KNOW?

Food Jags- Patterns of eating in which very few food items are eaten with the exclusion of all the others for a long period of time

Table 9 Balanced diet for preschool children

		Quantity(portions)	
Food groups	**g/portion**	**1-3 years**	**4-6 years**
Cereals and millets	30	2	4
Pulses	30	1	1
Milk (ml)	100	5	5
Roots and tubers	100	1	1
Green leafy vegetables	100	0.5	0.5
Other vegetables	100	0.5	1
Fruits	100	1	1
Sugar	5	3	4
Fats / Oils (visible)	5	5	5

Source: Dietary Guidelines for Indians - A manual, National Institute of Nutrition, ICMR, Hyderabad, India (2010)

- Unripe bananas and apples should not be given as they are difficult to chew and may choke the child.
- Candies and sweets should be in moderation. Foods like tea and coffee should not be given as they are more stimulating to the system.
- Foods should be seasoned so that they taste better and the child takes it well.
- Fried foods and concentrated foods should not be given as they are difficult to digest.
- The Child should never be forced to eat more than what he can take and the atmosphere should be peaceful, pleasant and lacking distraction.
- People feeding the child should not show dislike of any food in front of the child; this may lead to the rejection of the food by the child.
- Regularity of meals is essential.
- Food preferences of the child should be taken into consideration.

Nutritional Problems among Pre-Schoolers

Protein-Energy Malnutrition (PEM)

The primary cause of malnutrition is a faulty and inadequate diet. Besides diet and socioeconomic factors, various environmental factors aggravate the dietary deficiencies. These include chronic infection, poor environmental sanitation, poor insanitary living conditions and poor personal hygiene. The diseases that represent extreme forms of PEM are

i. Kwashiorkor
ii. Marasmus, and
iii. *Marasmic Kwashiorkor*

Vitamin-A deficiency

Inadequate dietary intake of vitamin A or its precursor (β-carotene) is exhibited as Bitot's spots, kertomalacia in preschool children.

▲ Fig 2 Bitot's spot

▲ Fig 3 Keratomalacia

Nutritional Needs during School Age (6-12 Years)

The school-age, six to twelve years, has been called the latent time of growth. The rate of growth slows down and body changes occur gradually. The slow rate of growth during this period result in a gradual decline in food requirement per unit of body weight.

Energy

Energy needs vary with growth rate, body size and physical activity. The requirement **for calories** increases during school age.

DO YOU KNOW?

Adiposity rebound is a phenomenon of normal growth, occurring at approximately 6 years of age which is when a child's body fat increases.

Protein

Girls require more protein than boys because they are reaching menarche. The protein requirements are slightly higher for girls than boys between 10-12 years.

Minerals

Calcium requirements are more to meet the need for skeletal development. They need to take 2-3 glasses of milk. Iron requirement is further increased by rise in the haemoglobin concentration.

Vitamins

Vitamin-A requirements of children is 600µg. Vitamin-C requirements are 40mg. Vitamin B complex requirements increase with calorie needs. The RDA of vitamins A and C are same as adult RDA.

Food Requirements

A natural increase in appetite is responsible for an increase in food consumption. Parents should encourage the child to eat appropriate portion sizes, eating a variety of food to meet their nutritional requirements.

Importance of breakfast

- Children who skip breakfast do not make up for the nutrition and energy needs and tend to perform poorly in academics(NIN, 2003-2004)
- Eating breakfast is a healthy habit.
- An ideal breakfast should have all 4 basic food groups.

Dietary Guidelines for School Children

- Nutritional requirements should meet their activity, growth and special requirements during sickness and injury.
- Menus should provide dishes that are quick to eat, nutritious and variety is needed.

Table 10 Balanced diet for School Going Children

		Quantity(g)		
		7-9 years	10-12 years	
Food groups	**g/portion**		**Boys**	**Girls**
Cereals and millets	30	6	8	10
Pulses	30	2	2	2
Milk (ml)	100	5	5	5
Roots and tubers	100	1	1	1
Green leafy vegetables	100	1	1	1
Other vegetables	100	1	2	2
Fruits	100	1	1	1
Sugar	5	4	6	6
Fats / Oils (visible)	5	6	7	7

Source: Dietary Guidelines for Indians - A manual, National Institute of Nutrition, ICMR, Hyderabad, India (2011)

DO YOU KNOW?

Food insecurity means having limited or uncertain availability of nutritionally adequate and safe foods or a limited ability to acquire appropriate foods.

- Weather conditions should also be considered-in hot season more of liquid should be included.
- Snacky meals should be given at intervals which can be easy to handle.
- Fruits and dry fruits can be given for snacks.

6.4 PACKED LUNCH: GUIDELINES FOR PREPARING NUTRITIOUS PACKED LUNCH FOR SCHOOL CHILDREN

Packed lunch has become a necessity for school children as it is not possible to have lunch at home. Packed lunch is a lunch in a tiffin box to be eaten by the child while away from home.

Points to be considered while planning packed lunches are:

1. It should meet one third of the day's nutritional requirements.
2. It should include food from all the four food groups though the number of dishes may be less.
3. Food stuffs providing good quality protein like egg, milk or milk products like paneer or curd would improve overall protein quality in combination with vegetable protein.
4. At least one serving of green leafy vegetables should be included.
5. One fruit or vegetable salad may be included every day.
6. Variety should be present.
7. Preferably the food packed should be different from that prepared for breakfast.
8. The dishes should be packed in the right consistency so as to avoid leakage or food becoming dry during lunch which may not be appetising to the child.
9. Following are two examples of a packed lunch.
   - Vegetable peas pulao, onion raita, boiled egg, banana.
   - Vegetable dhal rice, amaranth porial, soya gravy, and butter milk.

Activity 4

Match the following:

Vitamin A	tomato
Calcium	lemon
Iron	carrot
Vitamin D	liver
Vitamin C	milk
Lycopene	sunshine vitamin

2. List out the junk foods that are liked by school going children

6.5 NUTRITIONAL REQUIREMENTS DURING ADOLESCENCE

Adolescents is the period between childhood and adulthood. It is a period of rapid growth after infancy and it reaches its peak between 11th to 14th years for girls and 13th to 16th years for boys. Adolescence require more food for the following reasons:

a. this period (teenage) is spread almost over a decade,
b. it is characterized by rapid increase in height and weight, hormonal changes, sexual maturation and wide swings in emotion,
c. development of critical bone mass is essential during this period as this forms the ground for maintaining mineral integrity of the bone in later life,
d. the pattern and proportion of various body components like body water, muscle mass, bone and fat increase during the entire childhood and adolescence to reach adult values by about 18 years.

Adolescent girls are at greater physiological stress than boys because of menstruation. Their nutritional needs are of particular importance as they have to prepare for motherhood.

Nutritional Needs of Adolescents

Good nutrition is critical during the teenage years to ensure healthy growth and development. A healthy diet must meet the changing nutritional needs of a growing teenager.

Energy

Calorie needs is influenced by activity level, basal metabolic rate, increased requirements to support pubertal growth, development and energy expenditure. The energy requirements for boys are more than that of girls.

Protein

Protein needs of adolescents are influenced by the amount of protein required for maintenance of existing lean body mass and accrual of additional lean body mass during the adolescent growth spurt. When protein intakes are consistently inadequate, reductions in linear growth, delays in sexual maturation and reduced accumulation of lean body mass may be seen.

Fat and Essential Fatty Acids

The human body requires dietary fat and essential fatty acids for normal growth and development. The intakes of total fat and saturated fat should not exceed RDA.

Calcium

Calcium needs during adolescence are greater than they are in either childhood or adulthood because of the dramatic increase in skeletal growth. Milk provides the greatest amount of calcium in the diets of adolescents.Ragi, green leafy vegetables, milk and milk products are excellent sources of calcium.

Iron

Iron is vital for transporting oxygen in the bloodstream and for preventing anaemia. For both male and female adolescents, the need for iron increases with rapid growth and the expansion of blood volume and muscle mass. The onset of menstruation imposes additional iron needs for girls.

Zinc

Zinc is important in adolescence because of its role in growth and sexual maturation. Males who are zinc deficient experience growth failure and delayed sexual development.

Vitamins

Vitamin A is important for normal vision and plays a vital role in reproduction, growth, and immune function. The most obvious symptom of inadequate vitamin A

consumption is vision impairment, especially night blindness. The low intake of fruits, vegetables and milk and dairy products by adolescents contributes to their less than optimal intake of vitamin A.

Vitamin E is well known for its antioxidant properties, which become increasingly important as body mass expands during adolescence. Fortified breakfast cereals and nuts are good sources of vitamin E. Vitamin C is involved in the synthesis of collagen and other connective tissues

Fibre

Dietary fibre is important for normal bowel function, and plays a role in the prevention of chronic diseases, such as certain cancers, coronary artery disease, and type 2 diabetes mellitus and reduces the risk of obesity. Increased intake of fruit, vegetables, and whole grains increases the fibre intake. Adolescents who skip breakfast or do not routinely consume whole grain cereals are at high risk for having an inadequate consumption of fibre.

Dietary Guidelines for Adolescents

Diet in adolescents is very significant because it influences the nutritional status later in life.

- Adequate well balanced nutritious food should be taken to prevent obesity or under nutrition.
- An adolescent girl should take enough calcium rich foods in her diet to increase bone density and delay the onset of osteoporosis.
- Should not miss breakfast.
- Junk food should be avoided.
- Avoid empty calorie foods such as carbonated beverages.
- Iron rich foods may be included in the diet to prevent anaemia.
- Calorie and protein rich foods should be taken to support the growth spurt.
- Include fruits and vegetables in the diet to meet the vitamin, mineral and fibre requirement.

Table 11 Balanced Diet for Adolescents (Number of portions)

		10-12 Years		13-15 Years		16-18 Years	
Food groups	**g/Portion**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
Cereals & millets	30	8	10	11	14	11	15
Pulses	30	2	2	2	2.5	2.5	3
Milk & its products	100	5	5	5	5	5	5
Roots & tubers	100	1	1	1	1.5	2	2
Green leafy veg.	100	1	1	1	1	1	1
Other vegetables	100	2	2	2	2	2	2
Fruits	100	1	1	1	1	1	1
Sugar	5	6	6	5	4	5	6
Fat/oil (visible)	5	7	7	8	9	7	10

Source: Dietary Guidelines for Indians, National Institute of Nutrition, Hyderabad, 2011.

- Home based diets are best for children's growth.
- Adolescents need to be encouraged to do physical activity particularly outdoor games. Physical activity regulates appetite.

DO YOU KNOW?

Dysphagia means difficulty in swallowing

Nutrition Related Problems

- Acne Vulgaris
- Anaemia
- Obesity
- Eating Disorders
  i. Anorexia Nervosa
  ii. Bulimia Nervosa
  iii. Binge Eating Disorder
- Predisposition to Osteoporosis

DO YOU KNOW?

Competitive foods are less nutritious, such as high- fat, high-sugar snacks, soda and other sweetened beverages and these foods competes with healthier food choices for consumption.

Difference between Appetite and Hunger

- Appetite is defined as any of the instinctive desires necessary to keep up organic life, especially the desire to eat.
- Hunger is defined as a craving or urgent need for food or a specific nutrient due to lack of food.

How to promote increased fruit and vegetable intake:

- Add fruit purees and mixes into yogurt, milkshakes and pudding
- Grate vegetables and add to batter and dough while making idlies, dosas and chapattis
- Mix vegetable purees into soups and noodles.

Activity 5

Reflect on your food choices as teenager. Do you think your meal choices were balanced and varied? What could you have done to improve your nutritional habits at that time?

6.6 NUTRITIONAL NEEDS OF ADULTS

When an individual reaches adulthood, body growth especially in terms of height and body status stop to a certain extent, but tissue breakdown and repair of body tissues continue even among adults. Therefore adequate amount of essential nutrients need to be provided for maintenance of physical and mental health in adults.

Energy-Kilocalories

There is a gradual loss of functioning body cells and reduced physical activity so adults generally require less energy intake as they grow older. The basic fuels required to supply these energy needs are primarily carbohydrates with moderate fat.

Protein

The RDA for an adult necessities a protein intake of 0.8g/kg of body weight making the total protein. This amount of protein provides about 13-15% of the total calorie.

Carbohydrates

About 50-60% of the total diet calories should come from carbohydrate foods, with the majority being mostly complex carbohydrates such as starches. Easily absorbed sugars may also be used for immediate energy.

Fat

It provides a back-up energy source. Sufficient fat makes food taste better, aids appetite and provides needed kcal to prevent excessive weight loss.

Calcium and Phosphorus

In adults, calcium is required for replacing calcium lost from body through urine, feces, sweat and bile. Of the dietary calcium only 20-30% is absorbed and this is facilitated by vitamin D. A desirable intake of phosphorus is recommended. The elemental Ca:P ratio in the diet should be maintained at 1:1.

Iron

The loss of iron through sweat, gastrointestinal tract and urine is estimated to be 14 mg/kg body weight. Apart from this women have additional loss due to menstruation. Thus the iron requirements for women are more than men.

Vitamins

Studies have revealed that 600 mg of retinol daily would be sufficient to maintain a normal serum vitamin A level. The requirement for B Vitamins is based on calorie intake. Requirement of folic acid among Indians is 200µg.A daily intake of 20 mg vitamin C is sufficient to maintain ascorbic acid status. Since 50 percent

Table 12 Balanced Diet for Adults - Sedentary/ Moderate/ Heavy Activity

S. No	Food Groups	Portion g/Day	Activity					
			Sedentary		Moderate		Heavy	
			Man	Women	Man	Women	Man	Women
			Number Of Portions					
1.	Cereals And Millets	30	12.5	9	15	11	20	16
2.	Pules	30	2.5	2	3	2.5	4	3
3.	Milk	100ml	3	3	3	3	3	3
4.	Roots And Tubers	100	2	2	2	2	2	2
5.	Green Leafy Vegetables	100	1	1	1	1	1	1
6.	Other Vegetables	100	2	2	2	2	2	2
7.	Fruits	100	1	1	1	1	1	1
8.	Sugar	5	4	4	6	6	11	9
9.	Fats/ Oil Visible	5	5	4	6	5	8	6

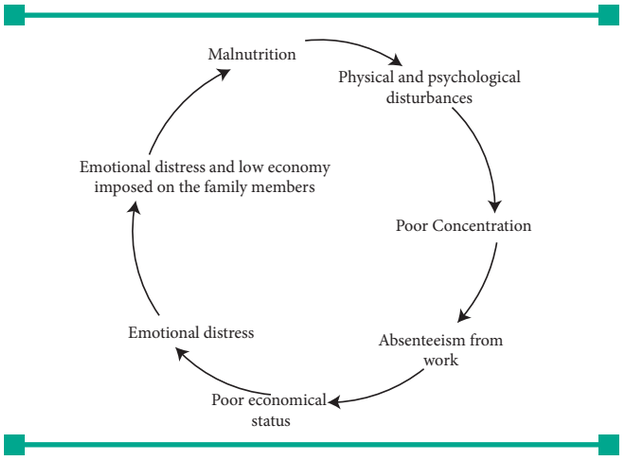
Source: Dietary Guidelines for Indians A Manual, NIN, Hyderabad (2011).

vitamin C is lost during cooking 40 mg of vitamin C per day is recommended.

Nutritional Problems for an Adult

- Osteoporosis
- Anemia
- Chronic Disease
- Diabetes Mellitus
- Underweight
- Coronary Heart Disease (CHD)
- Poor Nutritional Status

Many of the health problems of older adults are not only due to general aging but also due to states of malnutrition.



▲ Fig. 6.4 Malnutrition

6.7 NUTRITIONAL REQUIREMENTS OF PREGNANT AND LACTATING WOMEN

Nutrition requirements increase tremendously during pregnancy and lactation owing to the physiological changes.

DO YOU KNOW?

Primipara – A woman having her first child

Wholesome nourishment before pregnancy has a greater impact on the long term health on the mother and foetus. A well nourished foetus enters life with good physical and mental health.

Physiological Changes in Pregnancy

Foetal development is accompanied by many physiological, biochemical and hormonal changes which influence the nutrient needs and the efficiency with which the body utilizes them. The changes include

i. Increased basal metabolic rate (BMR)

Due to foetal growth the BMR increases.

ii. Gastro intestinal changes

Gastro intestinal motility diminishes which may result in constipation.

iii. Hormonal changes

During pregnancy there is increased secretion of the following hormones: i) Aldosterone ii) Progesterone iii) Thyroxin iv) Parathormone.

iv. Changes in body fluid

The blood volume expands by 50 percent and this increased amount of blood is required to carry nutrients to the foetus and remove metabolic wastes from the foetus.

v. Altered renal function

Increased blood volume and increased production of waste products like creatinine, urea and other wastes due to foetal and maternal metabolism produces a high glomerular filtration rate (GFR).

vi. Weight Gain during Pregnancy

Less than half of total weight gain resides in the foetus, placenta and amniotic fluid. Women with desirable body weight is 12.5 kg ranging between 11-13 kg.

6.7.1 Nutritional Needs during Pregnancy

In addition to the RDA for an adult women the nutritional needs increase during pregnancy.

Energy

Energy requirement during pregnancy is increased because of the additional energy required for growth and activity of foetus, growth of placenta and maternal tissues, increase in maternal body size and steady rise in BMR.

Protein

An additional protein intake is essential for:

- Growth of the foetus.
- Development of placenta
- Enlargement of uterus, mammary glands
- Increased maternal blood volume
- Formation of amniotic fluid

Fat

ICMR expert committee has suggested an intake of 30g of visible fat/day during pregnancy.

Calcium

Additional calcium is needed for the growth and development of bones as well as teeth of the foetus and also for the protection of calcium resources of the mother to meet the high demand of calcium during lactation.

Iron

The requirement of iron increases from 21mg/day to 35mg/day during pregnancy.

The increased requirement is due to

i. expansion of maternal tissues including red cell mass, iron content of placenta and blood loss during parturition.

DO YOU KNOW?

Pica refers to the compulsion for persistent ingestion of unsuitable substances that have little or no nutritional value like starch, clay and chalk.

ii. to build the iron store in foetal liver to last for at least 4-6 months after birth. This is because the baby's first food milk is deficient in iron.

Iodine

Due to increase in BMR, iodine needs are also enhanced during pregnancy.

Zinc

Deficiency of zinc adversely affects the outcome of pregnancy. Zinc deficiency leads to foetal mortality, foetal malformations and reduced intra uterine growth rate.

Sodium

Normal sodium intake without restriction is advised during pregnancy. Sodium is restricted when there is oedema or hypertension.

Vitamins

An additional allowance of Vitamin A is needed during pregnancy. Vitamin D is essential as it enhances maternal calcium absorption. Vitamin K is required for synthesis of prothrombin which is essential for normal coagulation of blood. A liberal vitamin K level in the mother's blood is helpful in preventing neonatal haemorrhage. Vitamin C, pyridoxine, and vitamin B12 needs are increased during pregnancy.

Folic acid

Folic acid is essential for increased blood formation i.e. haematopoiesis and for

synthesis of essential components of DNA/RNA which increase rapidly during growth.

Problems during Pregnancy

- Nausea and vomiting
- Constipation
- Heart burn
- Oedema and leg cramps
- Pica
- Anemia
- Pregnancy induced hypertension (PIH)
- Gestational diabetes

Lactation

Adequate nutrition for the mother during lactation is also of vital importance as the infant is dependent on mother's milk for its nutrition for the first few months of life. Inadequate nutrition during lactation is reflected on both the quality and quantity of milk secreted.

Physiology of lactation

The Table 13 below gives the summary of hormonal control of lactation.

Nutrient Needs during Lactation

ICMR nutrient recommendations for a lactating mother are based on the composition of breast milk and the fact that 850 ml of milk is produced daily. However, the milk secretion continues to increase in the early periods of lactation up to six months and then gradually decreases. Therefore the nutrient requirements are given for the two periods in lactation i.e. 0-6 months and 6-12 months.

Energy

The lactating mother requires additional energy for the production of milk. Based on the optimal output of 850 ml/day, the additional allowance is recommended during first six months of lactation.

Protein

Due to production of milk, protein requirement also increases.

Fat

The total fat in breast milk is not influenced by the mother's diet. The fat also provides energy density to meet the higher energy requirement during lactation.

Calcium

The requirement for calcium doubles during lactation.

Iron

Since most mothers have lactational amenorrhea, it results in saving of nearly 1mg iron per day which otherwise would

Table 13 Summary of Hormonal Control of Lactation

S. No.	Hormone	Source	Function
1	Estrogen	Ovary	Stimulates breast development
2	Progesterone	Placenta	Prepares breast for milk production by changing glandular cells to secreting cells
3	Prolactin	Anterior pituitary	Stimulates milk production
4	Oxytocin	Posterior pituitary	Facilitates release of milk from alveolus

Source: Srilakshmi (2011)

have been lost due to menstruation. There is a marginal increase in the iron intake.

Vitamins

The additional need of vitamin A during lactation is based on the amount secreted in the mother's milk. As the calorie and protein requirements increase during lactation, the requirements of B vitamins also increase correspondingly. Ascorbic acid content increases during lactation.

Galactogogues

Galactogogues are foods that help to produce more milk. Garlic, milk and almonds are considered to increase milk production. Studies carried out on nursing mothers have revealed that extra amounts of body building foods like fish and mutton increase the secretion of breast milk. Lactating mothers are also given special preparations containing ajwain and fenugreek seeds, which supply iron, protein, calcium and B- complex vitamins.

CASE STUDY

Case study 2

Jeni is pregnant. She comes for nutrition counselling. Explain to her the six nutrients that are required in larger amounts during pregnancy Describe their special roles and suggest four food sources for each.

6.8 NUTRITIONAL NEEDS AND CHALLENGES DURING OLD AGE

Individuals above the age of 60 years constitute the elderly. Health and well-being of the elderly is given more importance and has paved way for a specific field of study called "Geriatric Nutrition".

Aging

Aging is an irreversible biochemical change that occurs throughout an individual's life cycle and continues until death. In old age, the nutritional status is determined by the state of nutrition of an individual's cell. Conditions like dietary deficiency,

Table 14 A Balanced Vegetarian Diet For Pregnant and Lactating Mother Doing Sedentary Work

S.No	Food group	Pregnant mother Quantity (g)	Lactating mother Quantity (g)
1	Cereals millets	300	330
2	Pulses	60	90
3	Milk(ml)	500	500
4	Roots and tubers	100	100
5	Green leafy vegetable	150	150
6	Other vegetable	100	100
7	Fruit	200	200
8	Sugar	20	20
9	Fats and oil(visible)	30	30

Source: Dietary Guidelines for Indians - A manual, NationalInstitute of Nutrition, ICMR, Hyderabad, India, (1999)

improper digestion and absorption, insufficient distribution of nutrients, accumulation of excess waste products lead to poor nourishment of cells.

With increasing age, cell functioning is slowed down and their response to hormones and synthesis of enzymes decreases. These changes are associated with a decrease in the number of functioning cells. Since the cells are interdependent, if one cell dies, others of the same or different organ lose their ability to function resulting in malfunctioning of the organ. This in turn gradually affects the total body functioning leading to death.

NUTRITIONAL NEEDS DURING OLD AGE

Energy

The calorie intake should be adjusted to maintain weight. The energy requirement decreases due to the following reasons:

a. Decreased physical activity
b. Reduction in lean body mass and increase in adipose tissue
c. Decrease in resting metabolic rate by 15-20 percent due to changes in body composition and physical inactivity

Protein

The protein requirements do not change during old age. It is the same as adults i.e. 1g/kg of body weight.

Carbohydrate

Since the calorie requirement is reduced, the carbohydrate content should also be proportionately reduced. Due to impaired glucose tolerance and gastrointestinal disturbances like constipation, emphasis should be on taking complex carbohydrates.

Fat

The fat requirements are also reduced, corresponding to the energy requirements. The intake of saturated fats and cholesterol should be less and unsaturated fat should be used in cooking.

Minerals

Calcium needs increases during old age due to increasing mobilization of calcium from bones and incidence of osteoporosis. During old age 1000mg of calcium is recommended per day because of the following reasons.

- Limited availability of calcium from foods
- To compensate age related bone loss and to improve calcium balance
- To prevent fractures and tooth decay
- To compensate decreased efficiency of calcium absorption

Aging does not affect iron needs. Hence iron needs are same as that for adults. Mild anaemia may affect the health of old people due to inefficient circulation. Therefore iron intake should be adequate during old age.

Vitamins

Vitamin A requirements remain the same i.e., 600 µg of retinol. Inadequate exposure to sunshine may affect vitamin D levels. The antioxidant vitamins such as vitamin E, carotenoids and vitamin C have been identified to promote health of the elderly. Vitamin B6 requirements are also increased due to gastritis which interferes with absorption.

Besides these various nutrients, water should be consumed in plenty as such or as fluids like buttermilk, fruit juice and soups. Intake of sufficient fluids reduces

Table 15 Sample Menu

Time	Food Items
Early morning	Milk/tea/coffee
Morning	Idli/dosa Tomato chutney or vegetable sambar Fruit-1 slice
Mid-morning	Butter milk/soups/boiled eggs/ fruit salads
Lunch	Rice, sambhar, greens kootu, vegetable poriyal
Evening	Fruit yogurt/boiled sundal/custard
Dinner	Idiyappam/ idly/ dosa,vegetable stew/dhal,fruit.
Bedtime	Milk

the load on kidneys and relieves from constipation by stimulating peristalsis.

Nutrition Related Problems of Elderly

The elderly are at risk of poor nutrition due to economic pressure, poor dentition, aging tissues and inadequate diet, which may be compounded with the incidence of chronic disease. The commonly prevalent nutrition related problems among the aged include:

- Osteoporosis
- Obesity
- Anaemia
- Malnutrition
- Constipation
- Diabetes Mellitus
- Cardiovascular disease

Iron deficiency anemia is a serious public health problem throughout Central America, Like in India, Rice a staple food in Central America. It is typically polished and rarely iron-fortified.

6.9 DIETARY MODIFICATION DURING OLD AGE

CASE STUDY

Case study 3

An adult is on a limited budget and has poor vision and constipation. Knowing that fresh fruit and vegetables are often expensive, what suggestions would you make for your client to meet the suggested servings of five fruits and vegetables per day?

CASE STUDY

Case study 4

Mr. Ram is a healthy, active 82-year-old man. He exercises regularly and enjoys variety of foods. Recently he has started putting on weight. He says he eats exactly the same amount of food he ate when he was 30 years young. What dietary guidelines would you suggest to prevent constipation and additional unwanted weight gain?

Table 16 Modification of Diet For Elderly

Dietary modifications	Reasons
Foods must be soft and easily chewable	Problems of dentition -fallen teeth or dentures
Foods should be easily digestible	Decreased production of digestive enzymes
Restricted fat in diet, inclusion of Poly unsaturated fatty acid (PUFA)	Susceptible to heart diseases
Foods rich in fibre should be given	To prevent constipation, reduce cholesterol levels. Also to prevent colon cancer
Coffee, tea, cold beverages should be restricted	May result in insomnia
Foods rich in calcium such as is milk should be given	To compensate bone loss and prevent osteoporosis
Green leafy vegetables can be given liberally	Source of nutrients like: iron riboflavin, folic acid, vitamin c, antioxidants, carotene, and fibre
Familiar foods should be included (others difficult to digest) New foods are difficult to accept	Unfamiliar or changes in the food pattern- may lead to Psychological problems-depression and anxiety
Clear soup can be given at the beginning of the meal	Aids digestion
Small and frequent meals should be given instead of 3 heavy meals	Favours complete digestion, prevents distress
Glass of milk can be given before sleep	Induces sleep
Heavy meal-lunch Light meal-dinner	Sleep is less likely to be disturbed
Too many sweets with lots of fats and sugar should be avoided	Too much of sugar may cause fermentation, discomfort-due to indigestion and causes tooth ache and increases cholesterol level. May lead to obesity
Plenty of fluids	To prevent constipation and dehydration

Activity 6

Debate on the importance of vegetarian and non vegetarian diet

SUMMARY

1. An individual's needs for nutrients and energy change over the life span.
2. The need for nutrients increases during periods of growth such as infancy, adolescence and during pregnancy.
3. When the growth period declines, energy needs and the need for certain nutrients declines.
4. Nutrition for children and teens should focus on a balanced diet, with activity levels factored in, whereas in adults, both young and old, it is imperative to focus on preventing diet-related health problems.
5. Healthy dietary practices and habits and regular physical activity can help reduce

the chance of premature death and increase the chance of vitality.

6. This chapter emphasises the role of healthy diet, in the human life cycle from infancy to the elderly years and evaluates the role of nutrition in the promotion of health at every stage of the life cycle, identified.

GLOSSARY சொல்பொருள்

Allergy - (ஒவ்வாமை) A highly sensitive reaction of the body to certain substances, such as pollen, that are present in amounts that do not affect most people.

Amenorrhea - (மாதவிலக்கின்மை) *is a condition in which there is an absence of menstrual periods in a woman.*

Edema - (நீர்த்தேக்கம்) It is a swelling, usually of the legs, feet, or hands due to the accumulation of excessive fluid in the tissues.

Fortification - (மதிப்பை பெருக்குதல்) It refers to the practice of deliberately increasing the content of an essential micronutrient.

Glomerular filtration rate (கிளமரூல்ஸ் வடிக்கட்டும் விகிதம்) *is the test to measure level of kidney function and determine the stage of kidney diseases.*

Gruel - (கஞ்சி) It is a thinner version of porridge that may be more often drunk than eaten and may not need to be cooked.

Haemoglobin - (ஹீமோக்ளோபின்) It is a protein of red blood cells that contains iron and carries oxygen from the lungs to the tissues and carbon dioxide from the tissues to the lungs.

Heme iron - (ஹீம் இரும்புச்சத்து) *Heme iron* is derived primarily from hemoglobin and myoglobin in animal protein sources.

Hemorrhage - (குருதிப் போக்கு) *It* is a rapid loss of blood, usually due to a ruptured blood vessel, or a rapid loss of resources or valuable people.

Immune - (நோய் எதிர்ப்பு) It is protection against a particular disease by particular substances in the blood

Junk food - (துரித உணவுகள்) *It* is food containing high levels of calories from sugar or fat with little fiber, protein, vitamins or minerals.

Mashed foods - (மசித்த உணவுகள்) To crush *foods*(e.g. boiled potatoes) into a smooth, evenly textured mixture.

Nausea - (குமட்டல்) A feeling of sickness in the stomach marked by an urge to vomit.

Yoghurt - (தயிர்) It is a prepared food having the consistency of custard, made from milk curdled by the action of cultures, sometimes sweetened or flavoured.

ICT CORNER

Step: 1

Type URL or scan the QR code from your mobile. "Nuttri" App will open. Month wise child diet plan will appear. Click any food item to know the nutritional value in that diet

Step: 2

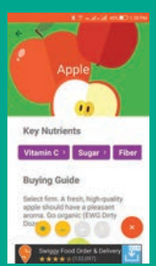
Click second tab and create your favourite diet and refused diet list

Step: 3

Click the calendar icon to plan a meal for a particular day

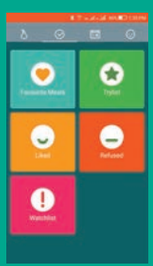
Step: 4

Then click last option to get many tips from the website (www.nuttriapp.com/references/)



Step1

Step2



Step3

Step4

Timeline Project's URL:

https://play.google.com/store/apps/details?id=com.app.tnpscjobs&hl=en&rdid=com.app.tnpscjobs

B179_11_HS_EM

QUESTIONS

G4KDHQ

I. Choose the correct answer

1. Nutrients are
   a. chemical substances or compounds in foods that have specific metabolic functions
   b. foods that are necessary for good health
   c. metabolic control substances such as enzymes
   d. foods use to cure diseases.
2. Which of the following foods has the highest iron content to help to meet the need for increased iron during pregnancy?
   a. Lean beef c. Orange juice
   b. Liver d. Milk
3. The increased need for vitamin A during pregnancy may be met by increased use of foods such as
   a. chicken c. citrus fruits
   b. egg white d. carrots
4. Fat is needed in the child's diet to supply
   a. minerals
   b. water soluble vitamins
   c. amino acids
   d. essential fatty acids
5. Iron deficiency is associated with
   a. scurvy c. anemia
   b. rickets d. pellagra
6. The basic biological changes of old age include
   a. an increase in the number of cells
   b. decreasing need for water
   c. an increased basal metabolic rate
   d. a gradual loss of functioning cells and reduced cell metabolism

II. Very short answer 2 Marks

1. Define balanced diet.
2. What is My Pyramid?
3. What are food exchange lists?
4. Define RDA.
5. Define weaning
6. List any two problems in weaning
7. What is the importance of weaning?
8. Define Osteoporosis
9. List any two snacks for an aged man with dentures.
10. What are the protein requirements of an adult?
11. Define Low Birth Weight infant.
12. Draw the food plate.
13. How can constipation be prevented?

III. Answer briefly 3 marks

1. List any three factors to be considered in planning packed lunch for school going children?
2. What are the common nutrient related problems among adolescents?
3. What essential nutrients would you suggest for the growth of bones in osteoporosis?
4. How can an individual reduce the risk of chronic disease?
5. Explain any three problems during pregnancy
6. If a pregnant women approaches you for diet counselling what dietary modifications would you recommend?
7. List the guidelines to be followed in planning a diet for a lactating mother?

8. Why does the energy requirement decrease during old age?
9. What are the causes of malnutrition during old age?
10. Distinguish between functional foods and nutraceuticals.

IV. Write in detail 5 Marks

1. Explain the steps involved in the planning of diet.
2. Give the RDA for an adolescent girl.
3. Outline the nutritional requirements of infants
4. Discuss on different types of supplementary food? Enumerate the important points to be considered in weaning.
5. Suggest liquid supplements that can be given for an infant belonging to a low income family.
6. Give any two supplementary foods prepared using local ingredients
7. A preschool child Ram does not eat fruits, vegetables and egg. He dislikes sundal also. What are the nutritional problems he is likely to face?
8. What dietary counselling would you give a mother for the nutritional problems faced by her 4 year old son?
9. Explain the nutritional requirements for school going children?
10. Explain the nutrient requirements of adolescents?
11. Explain in detail about the nutritional problems and requirements for an adult.
12. Explain to a pregnant mother why the nutrient requirements increase duringpregnancy?
13. What reason would you give a lactating women for increased nutrient intake?
14. Plan a day's menu for an elderly person.
15. What dietary advice would you give for an elderly person?
16. What are the nutritional needs for the elderly?
17. Suggest five packed lunches for Selvi, who is in standard VI.
18. Inadequate nutrient intake during adolescence will lead to health consequences in adulthood. Explain.

REFERENCES

1. Breast Feeding and use of Human Milk. Journal of American Academy of Paediatrics, 115 (2), 496-506.
2. DeBruyne KL, Pinna.B and Whitney. (2015) Nutrition and Diet therapy, Eighth edition. Wadsworth Centage Learning.
3. Devadas, RP. (1995) Dietary Guidelines, Avinashilingam Deemed University, Coimbatore.
4. Garrow.JS., James.WPT., Ralph.A., (ED) (2000) Human Nutrition And Dietetics., 9th edition, London, Church ill livingstone.
5. Gopalan C., Ramasastri BV. and Balasubramanian SC. (2000) Nutritive Value of Indian Foods. Revised and updated by BS. JarasingaRao, Y.G. Deosthale and K.C. Pant. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, India.
6. Guthrie AH. (1989) Introductory Nutrition. St. Louis, MO: Times Mirror/ Mosby College Publishing.
7. Joan. WG. Angela. M. and Michelle.H. (2012) Oxford Handbook of Nutrition and Dietetics. Oxford University Press.

8. Mahan LK and Escott –Stump .S (2004) Krause's-Food nutrition and diet therapy, 2nd edition, WB Saunders.
9. Mann.J., Truswell.A.S. (2007) Essentials Of Human Nutrition, 3rd edition, published by Oxford University Press.
10. National Institute of Nutrition. (2011) Dietary Guidelines for Indians A Manual, NIN, Hyderabad.
11. Robinson.CH, Marilyn RLr., Chenoneth LW. and Garinch AE. (1986). Normal and Therapeutic Nutrition. 17th ed. MacMillian Publishers. London.
12. Roth. SL. (2011) William's Essential Of Nutrition And Diet Therapy, 10th edition. Elsevier / Mosby.
13. Sohi.DA. (2011) Textbook For Nutrition, P.V. publishers, New Delhi.
14. Srilakshmi.B (2014) "Dietetics", New Age International (P) Limited Publishers.
15. Williams SR and Schlenker ED. (2011) Essentials of Nutrition and Diet Therapy, fifth edition, Times Mirror/Mosby College Publishing.
16. Williams SR, (2001) "Basic Nutrition Diet Therapy" Harcourt (India) private limited publishers, 11th ed., Delhi.
17. World Health Organization (2007) Conclusions and recommendations of the WHO consultation on prevention and control of iron deficiency in infants and young children in malaria-endemic areas. Food Nutr Bull., 28: S621–S627.
18. http://www.huffingtonpost.ca/2012/11/15/best-foods-for-iron_n_2130411.html
19. https://mohfw.gov.in/sites/default/files/24545352106148966387 3.pdf

B179_11_HS_EM