



ALAGAPPA UNIVERSITY

[Accredited with 'A+' Grade by NAAC (CGPA:3.64) in the Third Cycle
and Graded as Category-I University by MHRD-UGC]

KARAIKUDI – 630 003

DIRECTORATE OF DISTANCE EDUCATION



M.Sc. [Home Science – Nutrition and Dietetics]

365 12



NUTRITION AND HEALTH

I - Semester



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NUTRITION AND HEALTH

Author

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SYLLABI-BOOK MAPPING TABLE

Nutrition and Health

Syllabi	Mapping in Book
<p>BLOCK I: NUTRITION, DIET IN HEALTH AND PREGNANCY</p> <p>UNIT - 1: Nutrition and Diet in Health - Concept of Adequate Nutrition and Malnutrition. Difference between Hunger, Appetite and Satiety. Different Food Groups - Major Nutrients Present in Each Group, Guide in Menu Planning.</p> <p>UNIT - 2: Recommended Dietary Allowances - Basis for Requirements. ICMR Recommended Dietary Allowances (RDA) for Indians, FDA Recommendations, Basal Metabolic Rate (BMR) and Active Metabolic Rate (AMR). Balanced Diets.</p> <p>UNIT - 3: Nutrition in Pregnancy - Physiological Changes in Pregnancy. Nutritional Status and General Health. Importance of Preconceptional Nutrition. Weight Gain During Pregnancy and the Nature of Weight Gain. Factors Affecting Maternal Nutritional Status.</p> <p>UNIT - 4: Nutrition in Pregnancy - Requirements, Storage of Nutrients in Normal Pregnancy, Complications of Pregnancy and Nutritional Problems in Young and Too Old Expectant Mothers - Causes and Complications. Avoiding Pregnancy Associated Health Risk Through Nutrition - Gestational Diabetes, Iron Deficiency Anemia and Hypertensive Disorders.</p>	<p>Unit 1: Nutrition and Diet in Health (Pages 1-18);</p> <p>Unit 2: Recommended Dietary Allowances (Pages 19-36);</p> <p>Unit 3: Nutrition in Pregnancy (Pages 37-48);</p> <p>Unit 4: Nutrition in Pregnancy-II (Pages 49-65)</p>
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INTRODUCTION

NOTES

Food is one of the basic needs of life. It is required for growth, to maintain good health, to meet special needs during pregnancy and lactation and recovery from illness. Food is composed of nutrients required for our body. Upon consumption of food, organisms assimilate the nutrients present in them and use it for growth and replacement of tissues. The process of assimilation of nutrients is called 'Nutrition'.

Therefore, to lead a healthy life, we all need adequate food and nourishment. Food, which is essential for survival and growth of human beings, can also lead us to many health risks if not chosen properly. This book '*Nutrition and Health*' focuses on the relationship between food, nutrition and health.

This book, *Nutrition and Health*, is written with the distance learning student in mind. It is presented in a user-friendly format using a clear, lucid language. Each unit contains an Introduction and a list of Objectives to prepare the student for what to expect in the text. At the end of each unit are a Summary and a list of Key Words, to aid in recollection of concepts learnt. All units contain Self Assessment Questions and Exercises, and strategically placed Check Your Progress Questions so the student can keep track of what has been discussed.

BLOCK - I
NUTRITION, DIET IN HEALTH AND PREGNANCY

*Nutrition and Diet
in Health*

**UNIT 1 NUTRITION AND DIET IN
HEALTH**

NOTES

Structure

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1.0 INTRODUCTION

Health is a measure of functional and metabolic efficiency of an individual. It is affected by several factors, viz. socio-economic factors (income, access to healthy food, immunization, access to healthcare etc.), political factors (social security, justice etc.) cultural factors (beliefs, values, taboos etc.), hereditary factors (genetically fit or presence of genetic disorders) and environmental factors (condition of the habitat). In this unit, you will learn about the basics of nutrition and diet in maintaining health.

1.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss nutrition and diet in health
- Discuss concept of adequate nutrition and malnutrition

*Self-Instructional
Material*

- Explain the difference between hunger, appetite and satiety
- Discuss different food groups – major nutrients present in each group, guide in menu planning

NOTES

1.2 CONCEPT OF ADEQUATE NUTRITION AND MALNUTRITION

Health and nutrition are the most essential contributory elements for human resource improvement in the country. India has been categorised with the aid of the World Bank as a country with a lower middle income, with per capita GNP of US \$ 996-3945. It ranks 160 in terms of human improvement among 209 countries. Among the Indian population, about 28% in the rural and 26% in the urban areas are estimated to be under the poverty line, which is defined as the expenditure needed to obtain, on an average, 2400 Kcal per capita per day in the rural areas and 2100 Kcal in urban areas. Long-term malnutrition leads to stunting and wasting, non-communicable continual food regimen related disorders, improved morbidity and mortality, and decreased bodily work output. It is an exquisite monetary loss to the country and undermines development.

1.2.1 Concept of Malnutrition (Undernutrition and Overnutrition)

According to World Health Organization:

‘Nutrition is the intake of food, considered in relation to the body’s dietary needs.’

Food and Agriculture Organization defines malnutrition as:

A condition enough to “food deprivation” and “undernourishment” that using more than one term is often redundant. The term “malnutrition” - commonly used to mean the physical effects of restricted diet on the body - is used here to mean the biological and functional consequences of hunger.

The following are the components of **Good nutrition**

- An adequate and well-balanced diet
- Regular physical activity

The consequences of **Poor nutrition** are:

- Reduced immunity
- Vulnerability to diseases
- Improper physical and mental development
- Under productivity

1.2.2 Types and Causes of Malnutrition

The imbalances in the intake of nutrients leads to a condition called **malnutrition**. Deficient intake of essential nutrients leads to **undernutrition** while excess intake of nutrients is called **overnutrition**.

Malnutrition results in reduced productivity, reduced performance at work, reduced physical fitness.

Lack of formal education, lack of efficient economic structure, lack political involvement in upliftment of community forms basic causes of malnutrition. These causes lead to inadequate access to food, mother and child care and inefficient health care services worsening the conditions further. The table below will help you to understand causes of malnutrition better.

Table 1.1 Causes of Malnutrition

Basic causes	Lack of formal education, lack of efficient economic structure, lack political involvement in upliftment of community
Underlying causes	Inadequate access to food, inadequate mother and child care, inefficient healthcare services
Immediate causes	Inadequate dietary intake, infectious diseases
Outcomes	Malnutrition and death

Malnutrition refers to insufficient, excessive, or imbalance consumption of nutrients and in developed countries the diseases of malnutrition are frequently related to nutritional imbalance or excessive consumption of nutrients. Some of them area mentioned below.

Mental disorders: Lack of nutritional supplements may be a primary cause for major depression, bipolar disorder, schizophrenia and obsessive-compulsive disorder, the four most common mental disorders in developed countries. Supplements that have been studied most for helpful in stabilization include eicosapentaenoic acid and docosahexaenoic acid (each of which are an omega-3 fatty acid contained in fish oil, but not in flaxseed oil), vitamin B12, folic acid, and inositol.

Cancer: According to a study by the international agency for research for cancer, in the developing nations, cancers of the liver, stomach and oesophagus were more common, often linked to consumption of carcinogenic preserved foods, such as salted or smoked food, and parasitic infections that attack organs. Lung cancer rates are rising rapidly in poorer nations because of increased use of tobacco. However, in developed countries cancers of the colon, rectum, breast and prostate caused by obesity, lack of exercise, diet and age are very common.

Metabolic syndrome: Several lines of evidence indicate lifestyle-induced hyperinsulinemia and reduced insulin function in response to insulin resistance as decisive factors in many disease states. For instance, hyperinsulinemia and insulin resistance is strongly related to chronic inflammation, which in turn is strongly linked to a variety of unfavourable developments such as arterial microinjuries and clot formation as in heart disease and exaggerated cell division as in cancer. Hyperinsulinemia and insulin resistance—the so-called metabolic syndromes—are characterized by abdominal obesity in combination with elevated blood sugar, elevated blood pressure, elevated blood triglycerides, and reduced HDL cholesterol.

NOTES

Hyponatremia: Excess water intake, without replenishment of sodium and potassium salts, causes hyponatremia, which can further result in water intoxication at more detrimental levels.

NOTES

Check Your Progress

1. What is malnutrition?
2. What are the types of malnutrition?
3. What are the consequences of long term malnutrition?

1.3 PROTEIN-ENERGY MALNUTRITION

Protein Energy Malnutrition (PEM), micronutrient deficiencies such as vitamin A deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD) and vitamin B-complex deficiencies are the diet problems regularly encountered, especially amongst the rural and city slum communities. Undernutrition starts as early as throughout conception. Because of considerable maternal undernutrition (underweight, negative weight gain throughout pregnancy, nutritional anaemia and vitamin deficiencies), about 22% of the children are born with low birth-weight (2500 g), as in contrast to much less than 10% in the developed countries. Both medical and sub-clinical undernutrition are widely established even at some stage in early childhood and adolescence. Though the occurrence of varieties of extreme PEM like kwashiorkor and marasmus amongst preschool adolescents is 1 %, country wide surveys point out that about half of (48%) 5 yr. teenagers suffer from subclinical undernutrition such as underweight (43%) stunting and wasting (20%) which shows that undernutrition is of lengthy period. The research have proven that there is a steep increase in the prevalence of underweight with amplify of age, from 27% at 4-6 months of age to a high of 45% at 24 months of age . This is attributable to faulty child and younger child feeding practices prevailing in the community. Persistent undernutrition all through the developing segment of childhood leads to quick stature in adults. About 33% of person men and 36% of the female have a Body Mass Index (BMI) [Weight in kg/ (Height in meter)] below 18.5, which shows Chronic Energy Deficiency or CED. In the case of nutrition, a deficiency, 0.8- 1% of preschool youth show the signs and symptoms of Bitot's spots and night time blindness. Vitamin A deficiency additionally increases the chance of sickness and death.

Table 1.2 Incidence of Micronutrient Deficiency

With Prevalence	
1) Infants and Preschool children (%)	
Low birth weight	22 #
Kwashiorkor/Marasmus	<1 #
Bitot's spots	0.8-1.0
Iron deficiency anaemia (6 -59 months)	70.0#
Underweight (weight for age)* (<5 years)	42.6#
Stunting (height for age)* (<5 years)	48.0#
Wasting (weight for height)*	20.0
Childhood Overweight/ Obesity	6-30
2) Adults (%)	
a) Chronic Energy Deficiency	(BMI <18.5)
(i) Rural Adults	
Men 33.2	Women 36.0
(ii) Tribal Adults	
Men 40.0	Women 49.0
b) Anaemia (%)	
#Women (NPNL)	75.2
# Pregnant women	74.6
c) Iodine deficiency disorders (IDD)	
Goitre (millions)	54
Cretinism (millions)	2.2
Still births due to IDD (includes neo natal deaths)	90,000
PREVALENCE OF CHRONIC DISEASES	
a) Over weight/obesity (BMI>25) (%)	
(i) Rural Adults	
Men 7.8	Women 10.9
(ii) Tribal Adults	
Men 2.4	Women 3.2
(iii) Urban Adults	
Men 36.0	Women 40.0
b) Hypertension	
Urban 35.0	Rural 25.0
Men 25.0	Women 24.0
Tribal 24.0	
Men 25.0	Women 23.0
c) Diabetes Mellitus(%) (year 2006)	
Urban 16.0	Rural 5.0
d) Coronary Heart Disease(%)	
Urban 7-9	
Rural 3-5	
e) Cancer incidence Rate10 (Per 100,000)	
Men 113	Women 123

NOTES

1.4 DIFFERENCE BETWEEN HUNGER, APPETITE AND SATIETY

NOTES

Let's have a look at the concepts of hunger, appetite and satiety.

Hunger

By definition, hunger is the physiological “requirement” for sustenance. Various physiological prompts reveal to us that we are hungry, for example, a void or snarling stomach, a decline in blood glucose levels, and adjustments in coursing hormones (e.g., expanded glucagon and ghrelin and diminished insulin).

Appetite

By definition, appetite is the mental desire to eat, and is related with tangible encounters or parts of nourishment, for example, the sight and smell of food, passionate signals, social circumstances, and social traditions.

What is the distinction among appetite and hunger?

Appetite goes about as the more fundamental drive, while hunger is more an impression of eating encounters. Now and again we are not hungry but rather have a craving, (for example, seeing an enticing desert subsequent to eating full feast) or might be eager yet have not hunger, (for example, when we are wiped out).

All things considered, both appetite and hunger figure out what, when, and why we eat.

Satiety

By definition, satiety is the physiological and mental experience of “completion” that comes subsequent to eating or potentially drinking. You can call it as the opposite side of appetite and hunger is satiety, in straightforward words, it can likewise be called as a “feeling of totality”.

Various components impact the experience of satiety including gastric expansion, heights in blood glucose and changes in flowing hormones (e.g., expanded insulin and cholecystokinin, and diminished glucagon).

As a rule, feeling full is a component of the measure of nourishment one eats; that is, it ordinarily takes an entire sandwich, not only a nibble, to advance satiety. In any case, here and there it's the measure of nourishments eaten as well as the qualities innate in food that lead to completion. The water, fibre and macronutrient substance of the nourishments we eat would all be able to impact satiety.

Satiety index

To discover which nourishments, advance completion, specialists have built up a satiety rating scale that they call as the “satiety record” (SI).

Food positioning most noteworthy on this SI would in general be high in water or fibre content and in addition bring down in fat substance. Products of the soil are at the highest point of the SI rundown of nourishments. Truth be told, the most elevated SI score has been created by potatoes, which is multiple occasions the SI of white bread. Different sustenance positioning high in satiety after potatoes are angle, oat porridge, oranges, apples, wheat pasta, steak and heated beans.

1.4.1 Different Food Groups – Major Nutrients Present in Each Group

Nutrients are components of food that must be supplied to the body. These are needed by the body in adequate amounts in order to grow, reproduce and lead a normal, healthy life. Nutrients include protein, fats, carbohydrates, minerals and vitamins. Water and fibre are also important components of food. Basically nutrients are the chemicals that are needed for the growth and development of the body. The nutrients can be either **organic** in nature or **inorganic** in nature. The organic nutrients include carbohydrates, fats, proteins and vitamins whereas the inorganic nutrients include minerals and water.

The nutrients that are required in larger quantities by our body are known as **macronutrients** and those which are required in relatively smaller quantities are known as **micronutrients**. The macronutrients include carbohydrates, proteins, fats and water whereas the micronutrients include vitamin and minerals.

The nutrients are further classified as **essential and non-essential nutrients**. The **essential nutrients** are those which cannot be synthesized by our body and need supplementation through our diet. These include essential amino acids, essential fatty acids, vitamins and certain minerals; the list also includes water. Human body can derive energy from carbohydrates, proteins, fats and alcohols (ethanol) and synthesize amino acids for body requirements from these essential nutrients. The **non-essential nutrients** can have significant impact on health. This impact can be either beneficial or toxic. For example, the fibres present in the food are either not digested by the human gut nor do they give energy but despite that they facilitate and affect the digestion of other substances.

The science of nutrition deals with what nutrients we need, why we need these and where we can get them. Nutrition is the result of the kinds of foods supplied to the body and how the body uses the foods supplied.

Functions of nutrients in general:

Carbohydrates:

- They are present as STARCH (cereals) and SUGAR (sugarcane and fruits)

NOTES

NOTES

- Provides energy (1 gm of carbohydrates provides 4kcal of energy)
- Stored in form of glycogen in liver and muscles and excess in form of fats

Proteins:

- CASEIN (milk), ALBUMIN (egg), GLUTEN (wheat), soybean
- Building of new tissues and repair of those already built
- Regulatory and protective substances (enzymes, hormones and antibodies) formed from food proteins
- 10% energy supplies by protein in diet (1 gm of proteins provides 4kcal of energy)
- Excess of proteins is converted to carbohydrates and fats stored

Fats:

- OILS (seeds), BUTTER (milk), LARD (meat)
- Concentrated source of energy (1 gm of fats provides 9kcal of energy)
- Concentrated source of energy
- Carriers of fat soluble vitamins
- Excess is stored in fat reserves (adipose tissue)

Minerals:

- The important minerals in food are Calcium, Phosphorus, iron, iodine, sodium, chlorine, fluorine etc.
- Found in food combinations with organic and inorganic compounds
- They help in building up of body
- Building of bones and teeth and structural soft tissues are their major functions
- Regulation of processes in body (muscle contraction)
- They also help in regulating the water balance of the body

Vitamins:

- They are important in the growth of the body
- They help in regulating various body processes
- They are of two types: **fat soluble vitamins** and **water-soluble vitamins**
- The fat-soluble vitamins include vitamins A, D, E and K; the water-soluble vitamins include vitamins B and C.

Water:

- It is consumed in the form of drinking water, as beverage and water present in solid food.

- It helps in digestion of food and elimination of waste matter.
- It regulates various body processes and controls temperature of the body.
- The acid-base balance of the body is maintained with the help of water.

Fibre:

- It is present naturally in cereals, pulses, vegetables and fruits.
- It helps in digestion and removal of waste matter from the body.
- It helps in preventing and curing constipation

NOTES

Check Your Progress

4. Define the term 'nutrients'.
5. What are macronutrients and micronutrients?
6. What are essential nutrients?

1.5 CLASSIFICATION OF FOODS

Foods can be classified on the following basis:

Table 1.3 Classification of Foods

Classification of food on the basis of origin	Classification of food on the basis of chemical composition	Classification of food on the basis of functions (nutritional classification)
1. Foods of animal origin: such as meat, fish, poultry, milk	1. Proteins 2. Carbohydrates 3. Fats	1. Energy yielding foods 2. Body building foods 3. Protective foods
2. Foods of plant origin: such as cereals, pulses, nuts, fruits, vegetables	4. Vitamins 5. Minerals	

1.5.1 Nutritional Classification of Foods

Since foods vary widely in their contents of various nutrients, they have been broadly classified under three heads from the nutritional point of view:

- **Energy yielding foods:** Foods rich in carbohydrates and fats are called energy yielding foods. Cereals, roots and tubers, dried fruits, sugars and fats are included in this group. Cereals contain, in addition fair amounts of proteins, minerals and certain vitamins and form the important sources of the above nutrients in poor dietary sources.
- **Body building foods:** Foods rich in proteins are called body building foods. Milk, meat, fish, eggs, pulses oilseeds and nuts and low-fat oilseed flours are included in the group of body building foods.

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- **Protective foods:** Foods rich in proteins, vitamins and minerals are termed protective foods. Milk, eggs, liver, green leafy vegetables and fruits are included in this group. Protective foods are broadly classified in two broad categories:

1. Foods rich in vitamin, minerals, and proteins of high biological value, for e.g., milk, eggs and liver.
2. Foods rich in certain vitamins and minerals only, e.g., green leafy vegetables and fruits.

1.5.2 Food Groups

It is the method of classification of various foods that human beings consume daily, based on the nutritional properties of the foods. To facilitate the study of nutrients, experts from different food agencies have classified foods under various groups. These can be described as below:

Table 1.4 ICMR Five Food Group-Plan

Food Groups	Main Items
I. CEREALS, GRAINS AND PRODUCTS: Rice, wheat, ragi, bajra, maize, jowar, barley, rice flakes, wheat flour	Energy, protein, invisible fat, vitamin B1, vitamin B2, folic acid, iron, fibre
II. PULSES AND LEGUMES Bengal gram, black gram, green gram, red gram, lentils, (whole as well as dals), cow pea, peas, rajmah, soybeans, beans	Energy, protein, invisible fat, vitamin B1, vitamin B2, folic acid, iron, calcium, fibre
III. MILK AND MEAT PRODUCTS Milk: Milk, curd, skimmed milk, cheese Meat: Chicken, liver, fish, egg, meat	Protein, fat, vitamin B12, calcium Protein, fat, vitamin B2
IV. FRUITS AND VEGETABLES: FRUITS: Mango, guava, papaya, orange, sweet lime, water melon. VEGETABLES (GREEN LEAFY): AMARANTH, SPINACH, DRUMSTICK LEAVES, coriander leaves, mustard leaves, fenugreek leaves OTHER VEGETABLES: Carrots, brinjal, lady's finger, capsicum, beans, onion, drumstick, cauliflower.	Carotenoids, vitamin C, fibre Invisible fats, carotenoids, vitamin B2, folic acid, calcium, iron, fibre Carotenoids, folic acids, calcium, fibre
V. FATS AND SUGARS: FATS: Butter, ghee, hydrogenated oils, cooking oils like groundnut, coconut, mustard SUGARS: Sugar, jaggery	Energy, fats, essential fatty acids Energy

Significance of the five-food group plan can be understood by the following points:

- Planning wholesome balanced menus to achieve nutritional adequacies.
- Assessing the nutritional status. That is, a brief diet history of an individual can disclose inadequacies of food and nutrients from any of the five groups.

NOTES

Check Your Progress

7. What are the 3 basis of food classification?
8. What comprises the nutritional classification of food?

1.6 GUIDE IN MENU PLANNING

In this section, we will first look at meal planning for different age groups and then discuss the steps involved in meal planning.

1.6.1 Meal Planning for Different Age Groups

Meal planning is planning of meals with adequate nutrition for every member of the family within the available resources. The term 'available resources' means whatever the family has in terms of time, energy and money. Meal planning is essential for meeting the nutritional requirements of the family members. It helps us to decide what to eat each day and in each meal.

Meal planning can be alternatively called as our 'daily food guide'. This is important to us for following reasons:

- (a) to fulfil the nutritional requirements of the family members
- (b) make the food economical
- (c) cater to the food preferences of individual members
- (d) save energy, time and money
- (e) use leftover food

Infants and toddlers

Infants and toddlers have special dietary needs because of their rapid growth and development. Follow the advice of a health care provider in feeding them.

Preschool children

As young children begin to eat the same foods as the family usually about the age of 2 years or older, offer them foods that are moderate in fat and saturated fat but provide the calories and nutrients they need for normal growth.

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Serve young children the same variety of foods as everyone else, but in smaller amounts to suit their smaller needs—about 2/3 of the adult serving size. That would be a 1/4- to 1/3-cup portion of vegetable.

Be sure they have at least the equivalent of two cups of milk each day, but they can have it in several small portions—three 1/2-cup portions plus a 3/4-oz piece of cheese.

Because young children often eat only a small amount at one time, offer them nutritious “meal foods” as snacks—milk or fruit juice, cut-up fruit, vegetable sticks, strips of cooked meat or poultry, whole-grain crackers and peanut butter, half a sandwich, and so forth.

Parents and other adults can be a big influence by modelling healthy food choices and an active lifestyle.

School-age children

Calorie needs vary widely for elementary school children. They should eat at least include a number of servings from each of the five major food groups daily.

Most children will need more calories for growth and activity, they should eat larger portions of foods from the major food groups and some nutritious snack.

Go easy on fatty and sugary foods from the Pyramid tip, such as butter, margarine, salad dressings, candies and soft drinks, but don't forbid them. Have these as occasional treats.

Many children gain unwanted weight due to a sedentary lifestyle. Encourage physical activity, including outdoor play, to promote strength and fitness.

Teens and young adults

Teenagers and young adults till the age 24 should have three servings of milk, cheese, or yogurt daily to meet their calcium needs. Bone density increases well into the twenties. Eating foods providing adequate calcium to attain maximum bone density is very important in helping prevent osteoporosis and bone fractures in later life.

If milk is disliked, teens should include yogurts and cheeses as calcium sources. Dark-green leafy vegetables also supply calcium but in much smaller amounts per serving than dairy products. Calcium-precipitated tofu or calcium-fortified soy milks or fruit juices are other alternatives for people who are lactose intolerant.

Most teenage boys will need to eat the higher number of servings from each food group—the 2,800-calorie pattern. Most teenage girls will probably need the 2,200-calorie pattern—the middle of the ranges of servings— especially when they are active or growing. Teen girls who participate in vigorous sports may need the higher numbers of servings.

To control weight, encourage physical activity rather than repeated dieting. Eating low fat foods from the major food groups is a good way to lower calories without cutting vitamins and minerals important for growth and development.

Adults

The lower number of servings from each food group—the 1,600-calorie pattern—is about right for sedentary women and some older adults.

Other adults will need more calories than this, depending on body size and physical activity. Most men will need the middle to upper numbers of servings in the ranges. The lower to middle numbers of servings in the ranges are more appropriate for calorie needs of most women.

Regular exercise is important for all adults to maintain fitness. It also allows individuals to eat more food to get the nutrients they need without unwanted weight gain.

Women who are pregnant or breastfeeding should have at least three servings of milk, yogurt, or cheese to meet their calcium needs. They should also eat more breads and cereals, fruits, vegetables, and meat and meat alternates—the 2200 or 2800 calorie patterns. Physicians may prescribe a multivitamin and mineral supplement as well.

Older adults

Older people vary in their dietary needs. Some eat the same amounts as younger adults; others eat relatively less food.

The 1,000-calorie pattern (the lowest numbers of servings in the ranges) is about right for many older women; the 2200 calorie pattern (the middle numbers of servings) is right for many older men.

Because of difficulties chewing and decreased sensitivity to thirst, many older adults may need to make extra effort to get enough fluids (water, juices, milk, soups) and dietary fibre (vegetables, fruits, and whole-grain breads and cereals).

Regular physical activity such as walking can help maintain fitness and control weight.

Some nutrients seem to be needed in greater amounts and some in smaller amounts than for younger adults. In particular, older adults who eat less food than the 1,000-calorie pattern should consider taking a vitamin-mineral supplement under the supervision of a physician familiar with current research in geriatric nutrition.

1.6.2 Steps for Menu Planning

Arranging menus proper for youthful kids in the childcare setting begins with the feast design. Following the menu planning when arranging dinners helps ensure the

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feast is nutritious and fulfilling. Here are a few recommendations for arranging menus the kids will like.

Assortment - Plan a few days or seven days of dinners at any given moment. This will help the menu organizer abstain from rehashing nourishments time and again.

Colour - Think pretty much all the diverse shades of sustenance. Beautiful meals are more engaging. Shading in nourishments, for example, orange and green can show the nearness of nutrient A.

Texture - Include nourishments that are crunchy, chewy, and smooth. This will add enthusiasm to the meals.

Aroma - Prepare food that smells lovely. Preparing bread, cooking with flavours, for example, cinnamon, and sautéing onions are instances of smells that will invigorate cravings.

Arrangement - Place the sustenance on the plate with the goal that things don't contact. A few kids don't need their sustenance to contact one another. Focus on what food looks like on the plate. It should look great.

Choice - Allow youngsters to choose the nourishments they need to eat when conceivable. you can do this by offering a few diverse vegetable/organic product decisions and still meet the meal's design prerequisites.

Autonomy - Allow kids to serve themselves from serving holders. Youngsters are bound to eat the sustenance offered, and they will start to assume liability to their benefit nourishment propensities.

Menu planning

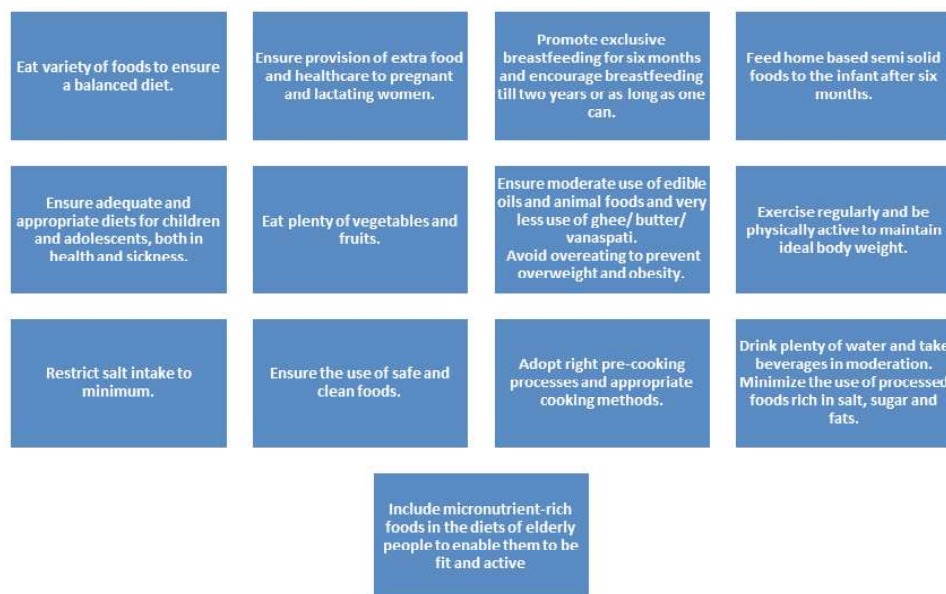


Fig. 1.1 Points to Keep in Mind for Menu Planning

Table 1.5 Portion Size of Foods (raw) and Nutrients

g/Portion	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
•Cereals & 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/ fish 50	•100	•9.0	•-	•7.0
•Milk and milk products (ml) 100	•70	•3.0	•5	•3.0
•Roots & Tubers 100	•80	•1.3	•18	•8
•Fruits 100	•40	•-	•-	•0.4
•Other vegetables 100	•20	•-	•10	•0.2
•Sugar 5	•45	•-	•12.5	•-
•Fat & Oils 5		•-	•5	•-
			•-	•9

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Check Your Progress

9. What is meal planning?
10. Why do you need meal planning?

1.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. As per Food and Agriculture Organization defines malnutrition as:
A condition enough to “food deprivation” and “undernourishment” that using more than one term is often redundant. The term “malnutrition” - commonly used to mean the physical effects of restricted diet on the body - is used here to mean the biological and functional consequences of hunger
2. The imbalances in the intake of nutrients leads to a condition called **malnutrition**. It is of two types deficient intake of essential nutrients leads to **undernutrition** while excess intake of nutrients is called **overnutrition**.
3. Malnutrition results in reduced productivity, reduced performance at work, reduced physical fitness. Some Malnutrition refers to insufficient, excessive, or imbalance consumption of nutrients and in developed countries the diseases of malnutrition are frequently related to nutritional imbalance or excessive consumption of nutrients. Some of them are cancer, mental syndrome, metabolic disorders etc.
4. Nutrients are the chemicals that are needed for the growth and development of the body. The nutrients can be either organic in nature or inorganic in

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nature. The organic nutrients include carbohydrates, fats, proteins and vitamins whereas the inorganic nutrients include minerals and water.

5. The nutrients that are required in larger quantities by our body are known as macronutrients and those which are required in relatively smaller quantities are known as micronutrients. The macronutrients include carbohydrates, proteins, fats and water whereas the micronutrients include vitamin and minerals.
6. The **essential nutrients** are those which cannot be synthesized by our body and need supplementation through our diet. These include essential amino acids, essential fatty acids, vitamins and certain minerals; the list also includes water. Human body can derive energy from carbohydrates, proteins, fats and alcohols (ethanol) and synthesize amino acids for body requirements from these essential nutrients.
7. Three basis of food classification are classification of food based on origin, classification of food based on chemical composition, classification of food based on functions (nutritional classification).
8. Food vary widely in their contents of various nutrients, they have been broadly classified under three heads from the nutritional point of view:
 - Energy yielding foods
 - Body building foods
 - Body protective foods
9. Meal planning is planning of meals with adequate nutrition for every member of the family within the available resources. The term 'available resources' means whatever the family has in terms of time, energy and money. Meal planning is essential for meeting the nutritional requirements of the family members. It helps us to decide what to eat each day and in each meal.
10. Meal planning is important to us for following reasons:
 - (a) to fulfil the nutritional requirements of the family members
 - (b) make the food economical
 - (c) cater to the food preferences of individual members
 - (d) save energy, time and money
 - (e) use leftover food

1.8 SUMMARY

- Health and nutrition are the most essential contributory elements for human resource improvement in the country. India has been categorised with the aid of the World Bank as a country with a lower middle income, with per capita GNP of US \$ 996-3945.

- The following are the components of Good nutrition
 - An adequate and well-balanced diet
 - Regular physical activity
- The consequences of Poor nutrition are:
 - Reduced immunity
 - Vulnerability to diseases
 - Improper physical and mental development
 - Under productivity
- The imbalances in the intake of nutrients leads to a condition called malnutrition. Deficient intake of essential nutrients leads to undernutrition while excess intake of nutrients is called overnutrition.
- Protein Energy Malnutrition (PEM), micronutrient deficiencies such as vitamin A deficiency (VAD), Iron Deficiency Anaemia (IDA), Iodine Deficiency Disorders (IDD) and vitamin B-complex deficiencies are the diet problems regularly encountered, especially amongst the rural and city slum communities.
- By definition, hunger is the physiological “requirement” for sustenance. Various physiological prompts reveal to us we are hungry, for example, a void or snarling stomach, a decline in blood glucose levels, and adjustments in coursing hormones (e.g., expanded glucagon and ghrelin and diminished insulin).
- By definition, appetite is the mental desire to eat, and is related with tangible encounters or parts of nourishment, for example, the sight and smell of sustenance, passionate signals, social circumstances, and social traditions.
- By definition, satiety is the physiological and mental experience of “completion” that comes subsequent to eating or potentially drinking.
- Nutrients are components of food that must be supplied to the body. These are needed by the body in adequate amounts in order to grow, reproduce and lead a normal, healthy life. Nutrients include protein, fats, carbohydrates, minerals and vitamins.
- Food group is the method of classification of various foods that human beings consume daily, based on the nutritional properties of the foods.
- Meal planning is planning of meals with adequate nutrition for every member of the family within the available resources. The term ‘available resources’ means whatever the family has in terms of time, energy and money. Meal planning is essential for meeting the nutritional requirements of the family members. It helps us to decide what to eat each day and in each meal.

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1.9 KEY WORDS

- **Protein Energy Malnutrition (PEM):** A marked dietary deficiency of both energy and protein resulting in undernutrition.
- **Recommended Dietary Allowances (RDA):** The amounts of dietary energy and nutrients considered sufficient for maintaining good health by the people of a country.

1.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is significance of five meal plan?
2. What should be a meal plan for older adults?

Long-Answer Questions

1. What are the major health problems in our country? Explain.
2. What are the steps in menu planning?
3. Prepare a sample menu plan for all the age groups.

1.11 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 2 RECOMMENDED DIETARY ALLOWANCES

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Structure

- 2.0 Introduction
- 2.1 Objectives
- 2.2 Balanced Diet
- 2.3 Recommended Dietary Allowances: Basis for Requirements
 - 2.3.1 ICMR Recommended Dietary Allowances (RDA) for Indians
- 2.4 Measurement of RDA Basis: Energy
- 2.5 Basal Metabolic Test
- 2.6 Active Metabolic Rate (AMR)
- 2.7 Answers To Check Your Progress Questions
- 2.8 Summary
- 2.9 Key Words
- 2.10 Self Assessment Questions and Exercises
- 2.11 Further Readings

2.0 INTRODUCTION

With the initiative of FAO in 1996, FBDGs were formulated. These replaced the dietary guidelines based on 5 food groups. National food-based dietary tips (FBDGs) furnish context-specific recommendation and ideas on wholesome diets and lifestyles, which are rooted on sound evidence, and respond to a country's public fitness and nutrition priorities, food manufacturing and consumption patterns, sociocultural influences, food composition data, and accessibility, amongst other factors. Typically, FBDGs advocate a set of guidelines in phrases of foods, meals companies and dietary patterns to furnish the required nutrients to promote typical fitness and forestall continual diseases. Yet, many nations are now shifting in the direction of extra holistic views with the aid of addressing food combos (meals), ingesting modalities, food safety considerations, way of life and sustainability elements in their FBDGs. 88% of nations face a serious burden of both two or three forms of malnutrition: acute and/or persistent undernutrition, micronutrient deficiencies, obesity and diet-related diseases (including type II diabetes, cardiovascular ailments and positive kinds of cancer). The causes of malnutrition are complex and multilayered, but food regimen is one of the single most important contributors to malnutrition, which itself is influenced by means of many factors, from private preferences to the wide country wide availability of foods. FBDGs can serve to information a large vary of meals and nutrition, health, agriculture and vitamin education insurance policies and programmes; consequently, representing a special possibility to favourably impact diets and the meals system, from manufacturing to consumption. In this unit, you will learn about the concept of dietary allowances through different tools.

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2.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss Recommended dietary allowances - Basis for requirements
- Explain ICMR Recommended Dietary Allowances (RDA) for Indians
- List FDA Recommendations
- Discuss Basal metabolic rate (BMR) and Active Metabolic Rate (AMR)
- Describe Balanced diets

2.2 BALANCED DIET

A balanced diet plan is one which presents all the vitamins in required quantities and desirable proportions. It can without problems be completed via a blend of the four basic food groups. The quantities of meals wished to meet the nutrient requirements range with age, gender, physiological status and bodily activity. A balanced diet plan has to provide around 50-60% of total calories from carbohydrates, ideally from complex carbohydrates, about 10-15% from proteins and 20-30% from each visible and invisible fat. In addition, a balanced diet plan ought to grant different non-nutrients such as dietary fibre, antioxidants and phytochemicals which bestow nice health benefits. Antioxidants such as vitamins C and E, beta-carotene, riboflavin and selenium protect the human physique from free radical damage. Other phytochemicals such as polyphenols, flavones, etc., also come up with the money for protection towards oxidant damage. Spices like turmeric, ginger, garlic, cumin and cloves are rich in antioxidants.

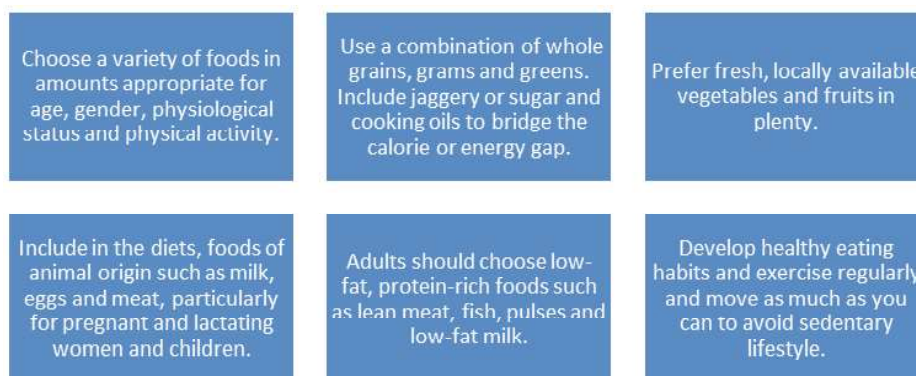


Fig. 2.1 Planning a Balanced Diet

2.3 RECOMMENDED DIETARY ALLOWANCES: BASIS FOR REQUIREMENTS

Requirements are the quantities of nutrients that wholesome human should attain from food to meet their physiological needs. The endorsed dietary allowances (RDAs) are estimates of nutrients to be consumed every day to make certain the necessities of all humans in a given population. The recommended level relies upon the bioavailability of vitamins from a given diet. The bioavailability suggests what is absorbed and utilized via the body. In addition, RDA consists of a margin of safety, to cowl variation between individuals, dietary traditions and practices. The RDAs are advised for physiological needs of infants, pre-schoolers, children, adolescents, pregnant women, lactating mothers, and grown up guys and women, considering their physical activity. In fact, RDAs are recommended averages/day. However, in practice, fluctuations intake may also take place relying on the food availability and needs of the body. But, the common requirements need to be at ease over a duration of time. Our diet plan ought to furnish sufficient calories, proteins and micronutrients to reap most increase potential. There may additionally be conditions that place ample quantities of vitamins can also not be accessible through food plan alone. In such excessive risk situations, the place unique nutrients are lacking, ingredients fortified with the limiting nutrient(s) become necessary. An accurate example of such fortified ingredients is the salt fortified with iron and iodine.

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Fig. 2.2 Balanced Diet for Toddlers

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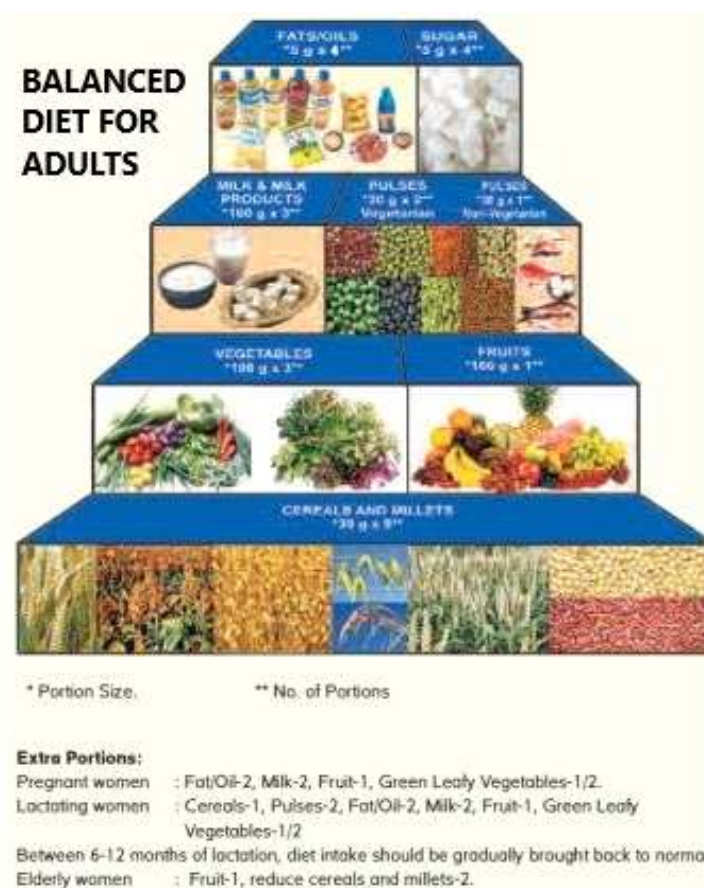


Fig. 2.3 Balanced Diet for Adults

FDA Recommendations

As mentioned on their website, the Food and Drugs Administration is a federal agency of United States which works:

- To protect the public health by assuring that foods (except for meat from livestock, poultry and some egg products which are regulated by the U.S. Department of Agriculture) are safe, wholesome, sanitary and properly labeled; ensuring that human and veterinary drugs, and vaccines and other biological products and medical devices intended for human use are safe and effective. Protecting the public from electronic product radiation
- Assure cosmetics and dietary supplements are safe and properly labeled
- Regulate tobacco products
- Advance the public health by helping to speed product innovations

The FDA recommendations of varied types including guidelines on food safety, food borne illnesses, safe handling of food, nutritional labels, packing, supplements, etc.

The Food Based Dietary Tips mentioned at the beginning of the unit is adapted by different countries in their own ways. In India, the dietary guidelines were launched in 1998. It is a revised version was published in 2011 by the name of ‘Dietary guidelines for Indians – a manual.’ The development of the dietary guidelines is spearheaded by the National Institute of Nutrition with the endorsement of the Ministry of Health. We will discuss the guidelines in the further units. In the next, section, you will learn about the ICMR recommended dietary allowances for Indians.

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2.3.1 ICMR Recommended Dietary Allowances (RDA) for Indians

In 1944, the Nutrition Advisory Committee of the Indian Council of Medical Research - ICMR made recommendations regarding nutrient requirements, dietary allowances and balanced Indian habitual diets to meet the Recommended Daily Allowance (RDA) of nutrients for Indians, based on the recommendations of the League of Nations’ Health Committee.

For computation of energy requirements, the reference body weight of Indians was taken as the 95th percentile of the body weights of Indians (Table 2.1) and the physical activity pattern (Table 2.2) as reported in the National Nutrition Monitoring Bureau, (NNMB) - rural survey. Energy requirements of Indians, as recommended by the ICMR Expert Group of 2009, are given in Table 2.3.

Table 2.1 Reference Body Weight of Indians (NNMB)

Group	Age (years)	Weight
Infants	0-6 months	5
	6-12 months	8
Children	1-3 years	12
	4-6 years	18
	7-9 years	25
Boys	10-12 years	34
	13-15 years	47
	16-18 years	55.5
Girls	10-12 years	35.0
	13-15 years	46.6
	16-18 years	52.1
Adults		
Men	18-30 years	60.0 Height 172 cm BMI 20.3
Women	18-30 years	55.0 Height 161 cm BMI 22.2

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Table 2.2 Activity Status in Rural India (NNMB)

Activity status	Men		Women		Total	
	n	%	n	%	n	%
Sedentary	1349	33.3	2705	62.7	4114	48.6
Moderate	2650	66.5	4282	37	4282	50.6
Heavy	48	1.2	14	0.3	62	0.8
Pooled	4047	100	4411	100	8458	100

n = sample size

Table 2.3 Recommended Energy Requirement

Age groups	Category	Requirements Kcal/day	Difference from 1989 RDA Kcal/ day
Man	Sedentary work	2318	-107
	Moderate work	2727	- 148
	Heavy work	3485	-315
Woman	Sedentary work	1899	+24
	Moderate work	2234	-9
	Heavy work	2854	-71
	Pregnant woman	+ 350	+50
	Lactating woman		
	0-6 months	+ 600	+ 50
6-12 months	+ 520	+ 120	
Infants	0-6 months	92 kcal/kg/day	-16 kcal/kg/day
	6-12 months	79 kcal/kg/day	-19 kcal/kg/day
Children	1-3 years	1036	-204
	4-6 years	1350	-340
	7-9 years	1691	-259
Boys	10-12 years	2189	-
	13-15 years	2748	+298
	16-18 years	3017	+377
Girls	10-12 years	2008	+48
	13-15 years	2328	+268
	16-18 years	2070	+10

*For weight gain of 10 kg in pregnant women

Table 2.4 Recommendations for Dietary Fat Intake in Indians

Groups	Minimum level of Total fat (%E)	Fat from foods other than visible fats ^a (%E)	Visible fat ^a	
			%E	g/p/d
Adult Man	20	10	10	25
				30
				40
Adult Woman	20	10	10	20
				25
				30
				30
Infants	0 – 6 months	40-60	Human milk ^f	
	7- 24 months	35 ^a	10 ^b	25
Children	25 ^c	10	15	25
				30
Boys	25 ^c	10	15	35
				45
				50
Girls	25 ^c	10	15	35
				40
				35

^a gradually reduce depending on physical activity, ^bHuman milk /infant formula+ complementary foods, ^cdepending on physical activity, ^dif higher than 10%E, visible fat requirement proportionately reduces, ^ecooking oils, butter, ghee and margarine, ^finfant formulae/milk substitutes should mimic contents of fat and fatty acids in human milk including arachidonic and docosahexaenoic acid.

Table 2.5 Calorie Requirements for Indians

Groups		Calcium (mg/d)	
Adults	Man	600	
	Woman	600	
	Pregnant Woman	1200	
	Lactating Woman	1200	
Infants	0-12 months	500	
Children	1-9 years	600	
Adolescents	10-12 years	Boys	600
		Girls	700
	13-15 years	Boys	800
		Girls	700
	16-18 years	Boys	600
		Girls	600

Recommended Dietary Allowances

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Table 2.6 Recommended Protein Intakes for Indians

Age groups	Safe Protein allowance (g/d)
Infants	
0-6 months	1.16 g/kg/d
6-12 months	1.69 g/kg/d
Children	
1-3 years	15.7
4-6 years	20.3
7-9 years	29.6
10-12 yrs - boys	39.3
10-12 yrs - girls	40.4
13-15 yrs - boys	54.2
13-15 yrs - girls	51.9
16 - 18 yrs - boys	61.5
16 - 18 yrs - girls	52.1
Adults	
Men	60.0
Women	55.0
Pregnant Women*	82.2 (55 + 27.2)
Lactating women	
0-6 months	77.9 (55 + 22.9)
6-12 months	70.2 (55 + 15.2)

*For weight gain of 10 kg in pregnant women

2.4 MEASUREMENT OF RDA BASIS: ENERGY

In this section, let's learn about the measurement of energy.

NOTES

Energy & Forms of Energy

ENERGY is the capacity to do work. The sun is the original source of energy, arising from nuclear reactions. Through the action of chlorophyll with sunlight, by the process of photosynthesis, plants synthesize carbohydrates from carbon-dioxide and water.

The carbohydrates stored by the plants are then available as energy to animals and to humans. Carbohydrates, proteins and fats are the energy yielding substances.

The energy or calorific values of foods depend upon quantity of carbohydrates, fats and proteins present in them.

Potential (storage) Energy is continuously available in the body from the small amounts of glycogen in muscle and liver, the sizable fat depots, and the cellular mass itself.

This potential energy is transformed to other forms to accomplish the work of body; for eg: mechanical energy (for muscle contraction); osmotic energy (to maintain the transport of fluids and nutrients); electrical energy; electrical energy (for the transmission of nerve impulses); chemical energy (as in the synthesis of new compounds); and thermal energy for heat regulation.

Whenever one form of energy is produced, another form is reduced by exactly. This is known as conservation of energy, which states that energy can be neither created nor destroyed.

When food supply is more energy than is needed for the work of the body, the excess is stored in the body, the excess is stored as fat; the result is weight gain. Our body utilizes energy from the food in form of chemical energy.

Measurement Units

The potential energy value of foods and energy exchange of the body are expressed in terms of calorie, which is a heat unit.

Kilocalories: It is amount of heat required to raise the temperature of 1 Kg water through 1 °C. In nutrition energy is expressed as calorie, Kilocalorie or Calorie.

Joules: The joule (J) is the unit of energy used in the metric system. It is the amount of energy expended when 1kg water is moved a distance of 1m by a force of 1 newton. It is energy expressed in mechanical equivalents, not heat equivalents.

$$1 \text{ Joules (J)} = 10^7 \text{ ergs}$$

$$1 \text{ kilocalories} = 1000 \text{ calories}$$

1 calorie (used in physics) = 4.184 J

1 kilocal = 4.184 KJ

1000 kilocal = 4.184 MJ

1 KJ = 0.240 kcal

1 MJ = 240 kcal

NOTES

Bomb Calorimeter

The fuel values of foods are readily given by means of an instrument known as *Bomb calorimeter*.

A weighed sample of dried food is placed in a heavy steel container called “bomb”. The bomb is placed in a well insulated vessel and is surrounded by a known volume of water.

After the bomb is filled with oxygen, the sample is ignited and the heat is dissipated into the water. By noting the change in the temperature of the water, one can calculate energy value of food by applying the definition for a calorie. Thus, the **heat of combustion** for the energy-nutrients is calculated.

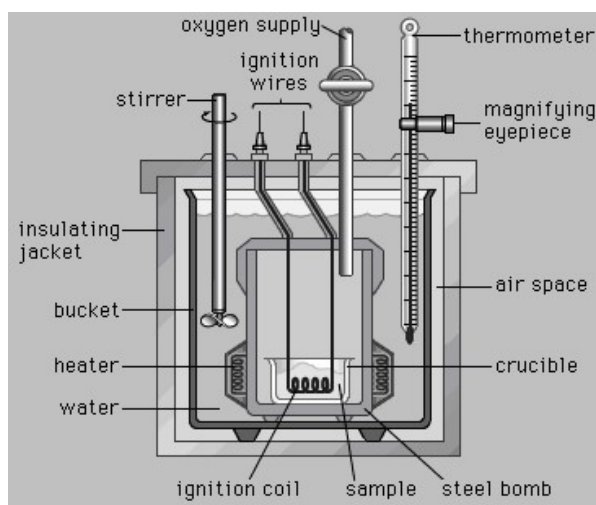


Fig. 2.4 Bomb Calorimeter

Physiologic Fuel Factors

Certain small losses occur in digestion so that it is necessary to reduce the values obtained in the bomb calorimeter to those that are physiologically available.

The co-efficient of digestibility is 98% for carbohydrate, 95% for fat, and 92% for protein.

In addition, the end products of protein metabolism such as urea and other nitrogenous products are combustible; their loss in the urine is equivalent to about 1.25 kcal/g proteins.

By applying these fuel corrections, **physiologic fuel factors**, first derived are carbohydrate and protein, per gram, 4 Kcal, fat per gram, 9 kilo cal, and alcohol, per gram, 7 kilo cal.

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Table 2.4 Physiologic Fuel Factors

Nutrients	Heat Of Combustion (K.Cal)	Digestibility (%)	Absorbed Energy Value (Kcal)	Urinary Losses (Kcal/Per Gm)	Physiologic Fuel Factors (K Cal)	Physiologic Fuel Factors (KJ)
Carbohydrates	4.1	98	4.02	-	4.0	17
Fats	9.45	95	8.98	-	9.0	38
Proteins	5.65	92	5.20	1.25	4.0	17
Alcohol	7.1	100	7.1 (5.6/ml)	0.1 (lungs)	7.0	29

Specific Fuel Factors

- Each food has a specific co-efficient of digestibility; and thus the fuel value likewise would be specific for each given food. For e.g.; the co-efficient of digestibility for the protein in milk, eggs, and meat is 97%, but for the protein of whole ground cornmeal it is only 60%; the co-efficient of digestibility for the carbohydrates of wheat is 98% when white flour (70 to 74% extraction), is used but is 90% when whole-wheat flour (97 to 100% extraction is used).
- Specific fuel factors are used in the tables of food composition.

Measurement of Energy Exchange of the Body

This is done in two ways.

Direct Calorimetry

It is the measurement of the amount of heat produced by the body.

By this method the individual is placed in a specially constructed chamber called “respiration calorimeter”.

The chamber is so well insulated that no heat can enter or escape through the walls.

The heat given off is picked up by water flowing through the coils in the chamber.

Measurements are made of the temperature of the water at the beginning of the study, at intervals and at the termination of the study. The volume of water flowing through the coils can also be calculated. The calories expended by can be measured by the above data.

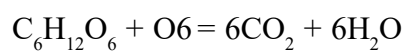
These calorimeters are very expensive are very expensive to construct and require careful attention to many details of measurement. They are used only in few research laboratories.

The respiration calorimeter is so well designed that the oxygen consumption and carbon-di-oxide excretion can be measured at the same time as the heat

production. The volume of oxygen consumed and carbon-di-oxide excretion can be measured at the same time as the heat production. The volume of oxygen consumed and carbon-di-oxide expelled permit the calculation of the **Respiratory Quotient (RQ)**, which can be stated as follows:

RQ = Volume of Carbon-Di-Oxide Expelled / Volume of Oxygen Consumed

- The RQ varies with the type of food being oxidized. For pure glucose:



$$RQ = 6CO_2 / 6 O_2$$

RQ = 1.0

- In case of fatty acids, such as palmitic acid **RQ=0.7**
- **Proteins** give an average of **0.8**
- For an ordinary mixed diet the **RQ = 0.85**
- In diabetes mellitus **RQ = 0.7**
- **Advantages of RQ:** Numerous studies using the respiration calorimeter have established that each RQ has a calorie equivalent that can be used to determine the energy expenditure under the given conditions. Thus, it becomes possible to determine the level of energy metabolism by the less time consuming and far less costly procedures of indirect calorimetry.

Indirect Calorimetry

It measures the amount of oxygen consumed in each period of time and, in other words than basal conditions, the amount of carbon-di-oxide excreted.

Numerous experiments on humans show that 1 litre of oxygen is equal to 4.825 kcal, when the conditions for basal metabolic test are met.

The energy expenditure at various levels of activities can be measured by a respirometer under conditions when the subject walks on a treadmill or rides on a stationary bicycle. In other situations, such as mountain climbing, or typing, or ironing, a portable apparatus is used. The light weight piece equipment consists of a meter for measuring the volume of expired air and a bag for collecting the sample of expired air. The air samples are analysed for their amounts of oxygen and carbon-di-oxide, and from the data it is possible to determine caloric equivalents.

Check Your Progress

1. What is energy?
2. What is Kilocalories?
3. Mention the co-efficient of digestibility.

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2.5 BASAL METABOLIC TEST

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The amount of energy required to carry out the involuntary activities of the body is known as **basal metabolic rate**.

It includes the functional activities of the various organs as the brain, heart, liver, kidneys, lungs, secretory activities of the glands, the peristaltic movements of the GIT, the oxidations occurring in resting tissues, and the maintenance of muscle tone and body temperature.

The brain and nervous tissue account for one-fifth of the energy utilized in the basal state, and the liver, kidneys, lungs and heart for an additional three-fifths.

The basal metabolic rate is measured by indirect calorimetry under the following specific conditions:

- Post-absorptive state: 12 to 16 hours after the last meal; usually performed in the morning.
- Reclining, but awake: ½ to 1 hour of rest before the test is necessary if there has been any activity in the morning.
- Relaxed and free from emotional upsets or fear of the test itself.
- Normal body temperature.
- Comfortable room temperature and humidity; about 21 °C to 24 °C.

Under these conditions, normal individuals fall within ±15 percent of standards, established from their body size, sex and age. Suppose, a young woman consumes 1,200 ml oxygen in a 6-minute test period; in a 24 hour period her basal heat expenditure is calculated as follows:

$$10 * 1,200 * 24 / 1,000 = 288 \text{ litres oxygen in 24 hours.}$$

$$288 * 4.825 \text{ kcal} = 1,390 \text{ kcal.}$$

Factors affecting BMR

The adult BMR is approximately *1 kcal per kg per hour for men and about 0.9 kcal per kg per hour for women*. It is affected by following factors:

- *Surface area*: About 80 percent of energy from glucose and fat is lost as heat, all but 15 % of heat loss being from the skin. The remaining heat loss occurs through lungs and through excreta. Since heat loss is proportional to the skin surface, the basal heat production is directly proportional to surface area.

A tall thin person has a greater surface area than an individual of the same weight who is short and fat, and the former therefore will have a higher basal metabolism. In clinical practice the energy expenditure is expressed as **kilocal per sq meter of body surface per hour**. Various charts have been developed by which surface area can be determined for any given height and weight.

The metabolic rate also has a linear relationship to metabolic body size, which is expressed as body weight to the three fourths power ($W^{0.75}$).

- *Sex*: Women have a metabolic rate 6 to 10 % lower than that of men. This can be due to the effect of female sex hormones.
- *Age*: Per unit surface area the basal metabolic rate is at its highest during the first two years of life. It declines gradually throughout childhood and accelerates slightly in adolescence. Thereafter, the decline continues throughout life and averages about 2% per decade after the age of 21. The rapid growth rate explains the high metabolic rate in early childhood. In the later years the lessened muscle tone and the reduction in muscle mass account for the lower rate.
- *Sleep*: During the sleeping hours the basal metabolism is about 10% lower than in walking state. However, this quite variable depending upon the amount of motion of the individual while asleep.
- *Body temperature*: An elevation of the body temperature above 37 C (98.6 F) increases the basal metabolism by 13 percent for each degree Celsius (7% for each for each degree Fahrenheit).
- *Endocrine glands*: The thyroid gland regulates the rate of energy metabolism, and any change in thyroid activity is reflected in the metabolic rate. If the thyroid is overactive (**Hyperthyroidism**), the metabolism may be speeded up as much as 75 to 100 percent; if the activity of the gland is decreased (**Hypothyroidism**), the metabolism may be reducing by 30 to 40%.

The growth hormones that stimulate new tissue formation are responsible in part for the higher metabolism that is observed in infants, children and teenagers.

- *Pregnancy*: During the last trimester of pregnancy the basal metabolism increases from 15 to 25 percent. The increase can be accounted for almost entirely by the increase in weight of the woman and the high rate of metabolism of the foetus.
- *State of nutrition*: Prolonged fasting or chronic undernutrition leads to a reduction in the basal metabolic rate. In some cases the decrease is proportional to the decrease in body weight, but in others the reduction is greater than can be explained on the basis of the loss of lean body mass. Although the mechanical involved are not understood, the change is important is adaptation because it decreases the number of nutrient stores that must catabolized each day.
- *Physical activity*: during the night following a day of strenuous muscular work, the metabolic rate may be higher after an inactive day. Although the trained athlete may have a slight higher basal metabolic rate than that of a non-athlete, the difference is negligible and appears to be related to increased lean body mass.

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Resting metabolism: The term resting metabolism should be differentiated from basal metabolism. It applies to the energy expenditure under normal life conditions while at rest. In addition to the energy expenditure that occurs during a day in which there is no exercise and no exposure to cold, resting metabolism includes the calorogenic effect of foods and considers the decrease in metabolism that occurs during sleep.

2.6 ACTIVE METABOLIC RATE (AMR)

Active metabolic rate is the amount of calories burnt by human body in a single day – 24 hours.

Activity Modifier is an estimate of how active you are depending on what type of activities you do in a daily or weekly basis.

Light Active = 1.25 → for some basic household chores and/or light exercise or sports 1-3 days/week

Habitual Daily Exercise = 1.40 → for doing some daily walking or cycling for at least 5 kilometres and/or moderate exercise or sports 3-5 days/week

Highly Active = 1.60 → for an athlete or a person performing hard exercise or sports 6-7 days/week or has a physical job

Formula in Calculating AMR

Active Metabolic Rate (AMR) = Basal Metabolic Rate (BMR) x Activity Modifier

Benefits in Calculating AMR

It helps to know how many calories a person has burnt in a day that will allow him or her to control the metabolism. If a person is on a restricted diet it is important to understand the body metabolism to keep track of the weight and eat less than the calories he or she is burning. AMR helps in adjusting the diet accordingly and get better results.

Factors Affecting Total Energy Requirements

1. Basal energy requirement
2. **Muscular activity:** Next to the basal energy requirements, physical activity accounts for the largest energy expenditure, in fact, for some persons who are vigorously active, the energy needs for the activity may exceed those for basal metabolism.
3. **Mental effort:** The nervous system is continuously active, and its energy requirement is about 20 percent of the basal rate. However, the energy expenditure beyond basal rate for intense mental effort as in problem solving or writing examinations does not add appreciably to the caloric equivalent.

Some students become tense and restless while solving problems, but increased expenditure of energy in such a situation is not primarily that of mental work.

4. **Calorigenic effect of food:** The ingestion of food results in an increase in the heat production known as Calorigenic Effect Of Food Or Diet Induced Thermogenesis (DIT) Or Specific Dynamic Action Of Food (SDA) Or Specific Dynamic Effect. Although it may be related to the digestion and absorption of food, increased heat production also occurs when nutrients are given intravenously thus suggesting that stimulation of cellular metabolism may be of prime importance. Protein when eaten alone has been shown to increase the metabolic rate the metabolic rate by 30%, where as carbohydrates and fats are produce much smaller increases. Based on mixed diets usually eaten, the calorigenic effect of food is approximately 10% of the total energy requirement.

5. **Maintenance of body temperature:** Under normal conditions the temperature of the body is controlled by the amount of blood brought to skin. Vasodilation of the blood vessels occurs when the environmental temperature is high and vasoconstriction occurs when the temperature is low. When the surrounding temperature is low, most of the heat is lost by radiation and convection, but when the environmental temperature is high, body heat is lost chiefly through evaporation. It is well known fact that more heat is lost by evaporation when the sir is dry than when humid.

During cold weather, excessive heat losses from the body are avoided by the use of suitable clothing and heating of the home or place of work. Moreover, body heat is conserved if there is a layer of adipose tissue under the skin. The subcutaneous fat serves to keep heat in the body rather than allowing it to be dissipated through the skin — an advantage in cold weather but a disadvantage in warm weather. Infants and young children have a relatively large surface area and lose much heat from the body when they are exposed.

When the body is subjected to extreme cold, the body temperature is maintained by an increase in the involuntary and often voluntary activity. The blood vessels constrict so that there is less blood reaching the skin surface, thus muscles become tense, and shivering follows. These involuntary activities result in a considerable increase in the metabolic rate. In addition, to the increased energy expenditure occasioned by the involuntary activities, the individual activities, the individual increases voluntary activities.

6. **Growth:** The building of new tissue represents storage of energy in one form or another; for e.g., every gram of protein in body tissue represents about4 kcal. When the growth is high in first years of life, the energy allowance must be high. Similarly, energy needs increases during pregnancy due to increase body weight and building of new tissues.

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Check Your Progress

4. What is BMR?
5. What are the factors affecting BMR?
6. What is respiratory quotient?

2.7 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Energy is the capacity to do work.
2. **Kilocalories:** It is amount of heat required to raise the temperature of 1 Kg water through 1 °C. In nutrition energy is expressed as calorie, Kilocalorie or Calorie.
3. The co-efficient of digestibility is 98% for carbohydrate, 95% for fat, and 92% for protein.
4. The amount of energy required of carry out the involuntary activities of the body is known as *basal metabolic rate*.
5. Factors affecting BMR are Surface area, Sex, Age, Sleep, Body temperature, Endocrine glands, Pregnancy, State of nutrition, and Physical activity.
6. The volume of oxygen consumed and carbon-di-oxide expelled permit the calculation of the **Respiratory Quotient (RQ)**, which can be stated as follows:

$$\text{RQ} = \text{Volume of Carbon-Di-Oxide Expelled} / \text{Volume of Oxygen Consumed}$$

2.8 SUMMARY

- National food-based dietary tips (FBDGs) furnish context-specific recommendation and ideas on wholesome diets and lifestyles, which are rooted on sound evidence, and respond to a country's public fitness and nutrition priorities, food manufacturing and consumption patterns, sociocultural influences, food composition data, and accessibility, amongst other factors.
- A balanced weight loss plan is one which presents all the vitamins in required quantities and desirable proportions. It can without problems be completed via a blend of the four basic food groups. The quantities of meals wished to meet the nutrient requirements range with age, gender, physiological status and bodily activity.

- Requirements are the quantities of vitamins that wholesome humans should attain from food to meet their physiological needs. The endorsed dietary allowances (RDAs) are estimates of nutrients to be consumed every day to make certain the necessities of all humans in a given population.
- The recommended level relies upon upon the bioavailability of vitamins from a given diet. The time period bioavailability suggests what is absorbed and utilized via the body. In addition, RDA consists of a margin of safety, to cowl variation between individuals, dietary traditions and practices.
- The RDAs are advised for physiological businesses such as infants, pre-schoolers, children, adolescents, pregnant women, lactating mothers, and grownup guys and women, taking into account their physical activity.
- Energy is the capacity to do work. The sun is the original source of energy, arising from nuclear reactions. Through the action of chlorophyll with sunlight, by the process of photosynthesis, plants synthesize carbohydrates form carbon-di-oxide and water.
- The energy or calorific values of foods depend upon quantity of carbohydrates, fats and proteins present in them.
- Potential (storage) energy is continuously available in the body from the small amounts of glycogen in muscle and liver, the sizable fat depots, and the cellular mass itself.
- **KILOCALORIES:** It is amount of heat required to raise the temperature of 1 Kg water through 1 °C. In nutrition energy is expressed as calorie, Kilocalorie or Calorie.
- **JOULES:** The joule (J) is the unit of energy used in the metric system. It is the amount of energy expended when 1kg water is moved a distance of 1m by a force of 1 newton. It is energy expressed in mechanical equivalents, not heat equivalents.
- Certain small losses occur in digestion so that it is necessary to reduce the values obtained in the bomb calorimeter to those that are physiologically available.
- The co-efficient of digestibility is 98% for carbohydrate, 95% for fat, and 92% for protein.
- **Direct Calorimetry:** It is the measurement of the amount of heat produced by the body. By this method the individual is placed in a specially constructed chamber called “respiration calorimeter”.
- **Indirect Calorimetry:** It measures the amount of oxygen consumed in a given period of time and, and in other words than basal conditions, the amount of carbon-di-oxide excreted.

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2.9 KEY WORDS

- **RDA:** It refers to the endorsed dietary allowances (RDAs) which are estimates of nutrients to be consumed every day to make certain the necessities of all humans in a given population.
- **Basal metabolic rate:** It refers to the amount of energy required of carry out the involuntary activities of the body.
- **Active metabolic rate:** It is the amount of calories burnt by human body in a single day – 24 hours.
- **Bomb calorimeter:** It refers to instrument which measures the fuel values of foods.

2.10 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are FBDGS?
2. Write a short note on balanced diets.
3. What are RDAs?
4. How is energy calculated?
5. What is the formula for calculating AMR?

Long-Answer Questions

1. Explain in detail the ICMR guidelines for Indians.
2. Describe the measurement of energy exchange of the body.
3. What are the factors affecting total energy requirements?
4. Discuss factors affecting BMR.

2.11 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 3 NUTRITION IN PREGNANCY

NOTES

Structure

- 3.0 Introduction
- 3.1 Objectives
- 3.2 Physiological Changes in Pregnancy
- 3.3 Nutritional Status and General Health
- 3.4 Importance of Preconceptual Nutrition
- 3.5 Factors Affecting Maternal Nutritional Status
- 3.6 Answers to Check Your Progress Questions
- 3.7 Summary
- 3.8 Key Words
- 3.9 Self Assessment Questions and Exercises
- 3.10 Further Readings

3.0 INTRODUCTION

Nutrition counselling is a cornerstone of prenatal care for all female throughout pregnancy. A woman's dietary reputation now not solely influences her health, but additionally pregnancy consequences and the health of her foetus-neonate. Physicians and different healthcare carriers want to be cognizant of nutritional needs in the course of pregnancy, as they range appreciably compared to non-pregnant populations. Furthermore, an individualized method to dietary counselling that considers a woman's get entry to food, socioeconomic status, race-ethnicity and cultural meals choices, and body mass index (BMI) is recommended. In addition, many of the pointers are geared for effortless pregnancies, so changes need to be made when complications, such as gestational diabetes, arise. A nutritionist or registered dietitian can help facilitate dietary counselling and interventions. In this unit, the maternal physiological adaptations as well as macronutrient and micronutrient necessities in the course of pregnancy and lactation will be reviewed. Other discussions on these subjects will encompass multiple gestations, weight problems in pregnancy, pregnancies after bariatric surgery, special diets, and common exposures in the course of pregnancy.

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3.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the concept of physiological changes in pregnancy
- Explain the significance of nutrition in pregnancy
- Describe Gestational weight gain

3.2 PHYSIOLOGICAL CHANGES IN PREGNANCY

In this section, let's learn about the physiological changes in pregnancy.

- Physiological modifications all through being pregnant alter the regular degrees of numerous laboratory values.
- Both total red blood cells mass and plasma extent increase, but plasma extent will increase to a higher extent resulting in haemodilution and anaemia during pregnancy. Consequently, a haemoglobin 10.5 g/dl or a haematocrit 32% is viewed anaemic all through the 2nd trimester.
- Serum total protein and albumin also minimize with the aid of approximately 30% in contrast to non-pregnant values. Additionally, due to the fact estrogen increases the hepatic manufacturing of positive proteins, there is larger protein binding of corticosteroids, sex steroids, thyroid hormones, and vitamin D for the duration of pregnancy, ensuing in lower free levels.

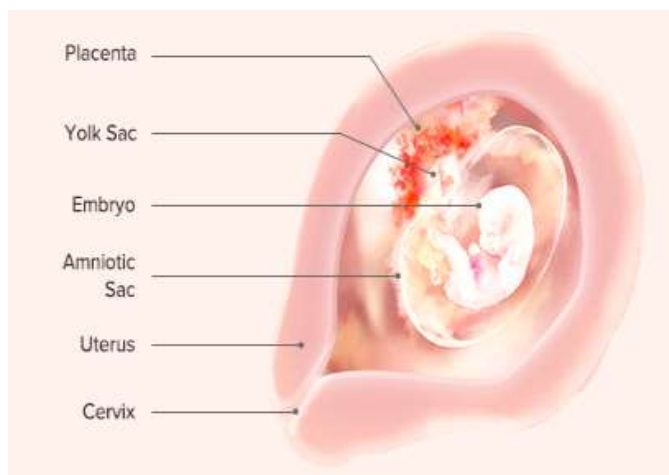


Fig. 3.1 Female Reproductive System

- Pregnancy is physiologically and nutritionally a rather stressful period. Extra meals is required to meet the requirements of the foetus.
- A female prepares herself to meet the nutritional demands with the aid of increasing her very own body fat deposits in the course of pregnancy.

- A lactating mom requires extra food to secrete enough quantity/ first-class of milk and to secure guard her personal health.
- Pregnancy is a stressful physiological state. In India, it is observed that diets of ladies from the low socioeconomic groups are similar throughout pre-pregnant, pregnant and lactating periods. Consequently, there is extensive maternal malnutrition main to excessive prevalence of low start weight infants and very excessive maternal mortality.
- Additional meals are required to enhance weight reap in being pregnant (10-12 Kg) and beginning weight of infants (about three Kg).

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3.3 NUTRITIONAL STATUS AND GENERAL HEALTH

The following points need to be considered with discussing nutritional status and general health during pregnancy.

- The everyday food regimen of a female need to contain an extra 350 calories, 0.5 g of protein during first trimester and 6.9 g all through second trimester and 22.7 g for the duration of third trimester of pregnancy
- Some micronutrients are in particular required in greater quantities at some point of these physiological periods. Folic acid, taken for the duration of the pregnancy, reduces the chance of congenital malformations and increases the birth weight
- The mother as well as the developing foetus needs iron to meet the excessive needs of erythropoiesis (RBC formation)

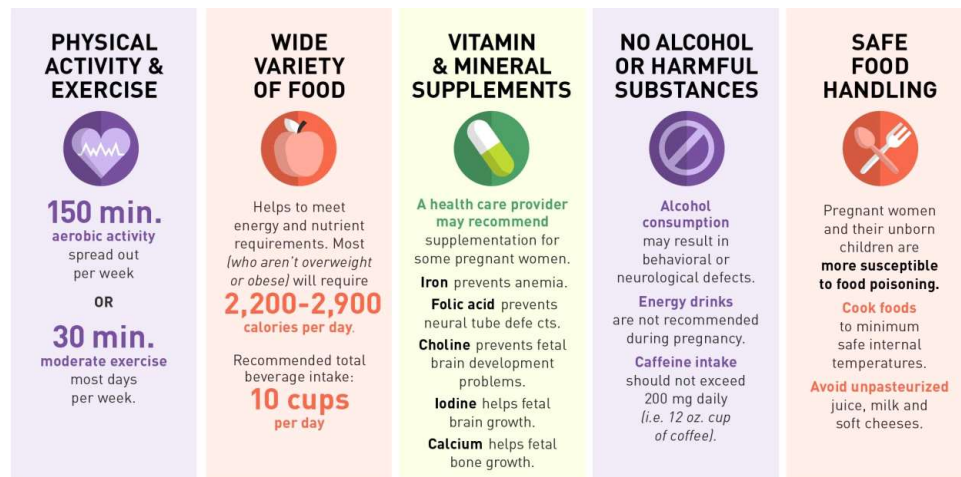


Fig. 3.2 Dos and Don'ts for Pregnant Women

- Calcium is essential, each in the course of being pregnant and lactation, for suited formation of bones and teeth of the offspring, for secretion of breast-milk wealthy in calcium and to stop osteoporosis in the mother. Similarly,

iodine intake ensures suitable intellectual health of the growing foetus and infant

- Vitamin A is required during lactation to enhance child and C need to be taken by the lactating mother.

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Importance of Nutrition

The pregnant/lactating lady have to consume a significant range of meals to make certain that her own nutritional wishes as well as these of her growing foetus are met.

There is no precise desire to alter the normal dietary pattern. However, the volume and frequency of utilization of the top-notch meals must be increased.

Mother can derive most quantity of electrical energy (about 60%) from rice, wheat and millets. Cooking oil is a concentrated supply of each power and polyunsaturated fatty acids.

Good nice protein is derived from milk, fish, meat, rooster and eggs. However, a perfect combination of cereals, pulses and nuts additionally affords sufficient proteins.

Mineral and vitamin necessities are met with the resource of ingesting a vary of seasonal vegetables specifically green leafy vegetables, milk and smooth fruits.

Bioavailability of iron can be extended by using the utilization of fermented and sprouted grams and meals rich in weight loss program C such as citrus fruits.

Milk is the quality provide of biologically accessible calcium.

Though it is conceivable to meet the necessities for most of the nutrients by a balanced diet, pregnant/lactating female are advocated to take day by means of day dietary supplements of iron, folic acid, diet B and calcium

Adequate intake of a nutritious diet is reflected in most beneficial weight gain in the course of pregnancy (10 kg) by way of the expectant woman.

She needs to pick meals prosperous in fibre (around 25 g/1000 kcal) like entire grain cereals, pulses and vegetables, to avoid constipation. She needs to take lots of fluids consisting of 8-12 glasses of water per day. Salt consumption must no longer be constrained even to forestall pregnancy induced hypertension and pre-eclampsia.

Excess intake of drinks containing caffeine like coffee and tea adversely affect foetal boom and hence, be avoided. In addition to these dietary requisites, a pregnant female must bear periodic fitness check-up for weight gain, blood pressure, anaemia and acquire tetanus toxoid immunization.

She requires adequate bodily exercise with adequate relaxation for 2-3 hrs all through the day.

Pregnant and lactating women should now not indiscriminately take any tablets barring clinical advice, as some of them could be unsafe to the foetus/baby. Smoking and tobacco chewing and consumption of alcohol should be avoided.

Wrong meals beliefs and taboos ought to be discouraged. The most essential food protection problem is microbial meals borne illness and its prevention all through being pregnant is one of the important public health measure. Avoiding contaminated foods is necessary shielding measure in opposition to food borne illness.

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3.4 IMPORTANCE OF PRECONCEPTUAL NUTRITION

Accomplishing and keeping up a sound healthful status amid the pre-pregnant period is fundamental for expanded ripeness and accomplishing a great pregnancy. Factors, for example, keeping up a sound bodyweight and devouring satisfactory measures of folate and omega-3 unsaturated fats enhance results, while introduction to liquor, caffeine, and ecological poisons can adversely affect wellbeing.

Pre-pregnancy Obesity

The normal eating routine comprises mostly of vitality thick sustenance wealthy in sugar, starch, and soaked fats, while being inadequate in organic products, vegetables, entire grains, and lean meats. This unfortunate method for eating, prompts overweight, heftiness, and different dietary inadequacies. An expanding pervasiveness of stoutness has turned out to be a standout amongst the most critical worldwide wellbeing dangers. Weight is exceedingly pervasive among ladies of childbearing age. Notwithstanding the expanded danger of cardiovascular ailment, kidney malady, malignant growth, and diabetes, ladies who are large are bound to create pregnancy related complexities, for example, hypertensive issue, gestational diabetes, and C-segment conveyances.

Key Nutrients

All ladies of conceptive age are encouraged to expend a reasonable, solid eating regimen comprising of organic products, vegetables, entire grains, nuts, seeds, and vegetables. To advance ideal foetal and maternal wellbeing, two key supplements folate and omega-3 unsaturated fats are suggested amid the assumption stage.

- **Folate and Folic Acid**

Folate is a water dissolvable B nutrient that is normally discovered nourishments, for example, organic products, dull green verdant vegetables, vegetables, nuts, dairy items, grains, and meat. for example, spinach, Brussels sprouts, asparagus, and yeast contain probably the largest amounts of folate. Neural cylinder abandons (NTD) are infections identified with folic corrosive lacks and influences more than

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2,500 babies conceived in the United States each year. NTD are birth deformities of the spine, mind, or spinal line. The two most basic NTD are anencephaly and spina bifida. These deformities occur inside the main month of pregnancy, ordinarily before the mother even knows she's pregnant.

- **Omega-3 unsaturated fats**

Another supplement that is broadly prescribed amid the previously established inclination time frame is omega-3 unsaturated fats. Omega-3 unsaturated fats are lipids that are not made in the body and should be ingested through the eating routine or by supplementation. They are required for physiological capacities, for example, vitality stockpiling, cell multiplication, control of irritation, and cell layer improvement.

3.5 FACTORS AFFECTING MATERNAL NUTRITIONAL STATUS

In most of the developing nations, the maternal malnutrition is on rise. Ensuring every pregnant woman receives ample nutrition should be of utmost importance. There are various including socio economic, environment factors that affect the maternal nutritional status. One must look after following parameters to ensure proper nutrition of the pregnant female.

- Eat greater food all through pregnancy.
- Eat extra complete grains, sprouted grams and fermented foods.
- Take milk/meat/eggs in adequate amounts.
- Eat masses of greens and fruits.
- Avoid superstitions and food taboos.
- Do not use alcohol and tobacco. Take drugs only when prescribed.
- Take iron, folate and calcium dietary supplements regularly, after 14-16 weeks of two pregnancy and proceed the equal for the duration of lactation.

Folic acid is critical for the synthesis of haemoglobin. two Folic acid deficiency leads to macrocytic anaemia.

Pregnant women want more of folic acid. Folic acid dietary supplements amplify delivery weight and limit congenital anomalies. Green leafy vegetables, legumes, nuts and liver are desirable sources of folic acid. 500 mg (0.5mg) folic acid supplementation is recommended preconceptionally and throughout pregnancy for ladies with records of congenital anomalies (neural tube defects, cleft palate). two

Iron is wanted for haemoglobin synthesis, intellectual characteristic and to grant immunity in opposition to diseases. Deficiency of iron leads to anaemia. Iron deficiency is common particularly in girls of reproductive age and children. Iron deficiency during being pregnant increases maternal mortality and low birth weight infants.

In children, it increases susceptibility to infection and impairs mastering ability. Plant ingredients like inexperienced leafy vegetables, legumes and dry fruits comprise iron. Iron is also acquired via meat, fish and poultry products. Iron bio-availability is poor from plant ingredients but is suitable from animal foods.

Vitamin C - prosperous fruits like gooseberries (Amla), guava and citrus improve iron absorption from plant foods.

Beverages like tea bind dietary iron and make it unavailable. Hence, they ought to be avoided earlier than at some point of or soon after a meal.

Commonly consumed plant based diets supply around 18mg of iron as in opposition to recommended intake of 35mg per day. Therefore, supplementation of iron (100 mg elemental iron, 0.5 mg folic acid) is endorsed for one hundred days at some point of th being pregnant from sixteen week onwards to meet the demands of pregnancy.

Breast-milk is the most herbal and best meals for regular growth and wholesome development of infants.

Colostrum is prosperous in nutrients and anti-infective factors and be fed to infants.

- Breast-feeding reduces chance of infections.
- It establishes mother-infant contact and promotes mother-child bonding.
- It prolongs birth interval by fertility manipulate (delayed return of menstruation).
- Breast-feeding helps in retraction of the uterus.

Incidence of breast most cancers is decrease in mothers who breast feed their children.

Table 3.1 Recommended Daily Dietary Allowances for Pregnant and Lactating Women

Nutrient	Non-Pregnant	Pregnant	Lactation
Vitamin A (µg/d)	700	770	1300
Vitamin D (µg/d)	5	15	15
Vitamin E (mg/d)	15	15	19
Vitamin K (µg/d)	90	90	90
Folate (µg/d)	400	600	500
Niacin (mg/d)	14	18	17
Riboflavin (mg/d)	1.1	1.4	1.6
Thiamin (mg/d)	1.1	1.4	1.4
Vitamin B ₆ (mg/d)	1.3	1.9	2
Vitamin B ₁₂ (µg/d)	2.4	2.6	2.8
Vitamin C (mg/d)	75	85	120
Calcium (mg/d)	1,000	1,000	1,000
Iron (mg/d)	18	27	9
Phosphorus (mg/d)	700	700	700
Selenium (µg/d)	55	60	70
Zinc (mg/d)	8	11	12

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Table 3.2 Typical Composition of Micronutrients in a Prenatal Vitamin**NOTES**

Component	Amount	% Daily Value for Pregnant and Lactating Women
Vitamin A	4,000 IU as beta carotene	50%
Vitamin D ₃	400 IU as Cholecalciferol	100%
Vitamin E	11 IU as dl-Alpha Tocopheryl acetate	37%
Folic acid	800 µg	100%
Niacin	18 mg as niacinamide	90%
Riboflavin	1.7mg as thiamin mononitrate	85%
Thiamin	1.5 mg	88%
Vitamin B ₆	2.6 mg as pyridoxine hydrochloride	104%
Vitamin B ₁₂	4 µg as cyanocobalamin	50%
Vitamin C	100 mg as ascorbic acid	167%
Calcium	150 mg as calcium carbonate	12%
Iron	27 mg as ferrous fumarate	150%
Zinc	25 mg as zinc oxide	167%

Folic acid is the synthetic structure of the naturally occurring B vitamin, folate. Folic acid is the structure used in most nutrition supplements and meals fortification. As mandated by the Food and Drug Administration, in many instances fortified ingredients consist of bread, cereal, and pasta.

Folate-rich meals sources are citrus fruits, dark-green leafy vegetables, nuts, and liver. Folate necessities enlarge for the duration of being pregnant as a result of swiftly dividing cells related to fetal growth. Notably, folic acid supplements (400-800µg daily) taken prior to idea can limit the chance for neural tube defects in the fetus.

In order to limit the chance for neural tube defects in their offspring, girls are advocated to take folic acid from fortified meals or supplements day by day in addition to consuming a weight loss program wealthy in meals sources of folate.

Women with a records of a neural tube defect in a prior pregnancy should take a higher dose (4mg) of folic acid day by day for subsequent pregnancies. Deficiencies in folate have been associated with megaloblastic anaemia in pregnancy, though no longer with other being pregnant consequences such as preterm beginning or stillbirths.

Iron supplements have routinely been recommended in pregnancy because iron needs almost double during pregnancy.

A fashionable prenatal diet includes 27 mg of elemental iron.

Vitamin C dietary supplements can help with iron absorption, whereas milk and tea can inhibit iron supplementation.

Women with iron deficiency, described by using a ferritin level 15 µg/L, can amplify their haemoglobin with the aid of 2 g/dL over a one month duration with a day by day alternative of 60-120 mg of elemental iron.

Common facet results of iron, such as belly pain, constipation, nausea, and vomiting are regularly reasons why ladies are now not compliant with iron supplementation. Iron-rich meals consist of purple meat, pork, fish, and eggs.

Vitamin D is a fat-soluble nutrition that is primarily discovered in fortified milk or juice; herbal sources encompass eggs and fish such as salmon. The skin also manufactures vitamin D when it is exposed to sunlight.

Regardless of the supply – oral ingestion vs. pores and skin absorption – similarly processing in the liver and then the kidney is required to create the energetic form, 1,25-dihydroxyvitamin D, which promotes calcium absorption from the intestines and thereby permits terrific bone mineralization and growth. Vitamin D deficiency is common in pregnancy, mainly in high-risk companies such as vegetarians, women who stay in cold climates, and ethnic minority ladies with darker skin. Severe vitamin D deficiency has been associated with congenital rickets and fractures. While Vitamin D levels can be measured by means of a serum stage of 25-hydroxy vitamin D, an most efficient degree during being pregnant has now not been established. Furthermore, there is inadequate evidence to propose screening all pregnant female for diet D deficiency. If vitamin D deficiency is determined at some stage in pregnancy, then supplements (1000-2000 IU per day) can be given. In addition, hobbies nutrition D supplementation all through pregnancy to forestall preeclampsia is additionally not recommended.

Vitamin A is critical for cell differentiation and proliferation as properly as improvement of the spine, heart, eyes, and ears.

Although most micronutrients have a huge protection margin with little challenge for teratogenic effects, nutrition A is one exception. Excessive doses of Vitamin A (10,000 IU/day) have been related with cranial-facial (face, palate, ears) and cardiac beginning defects. The maximal supplement in being pregnant is 8000 IU/day. It is the retinol structure of Vitamin A that is related with teratogenic effects, not the carotenoid version found in food sources such as carrots

Weight gain in pregnancy

Pregnancy has historically been viewed a time for weight gain, not weight loss. The compulsory weight reap during pregnancy is about eight kg which accounts for the foetus, the placenta, amniotic fluid volume, and variations to maternal tissues (e.g., uterus, breast, blood volume).

A weight reap much less than this quantity implies that current maternal adipose and protein stores would be mobilized to support the pregnancy. Metabolic changes of girls who lose weight for the duration of being pregnant are no longer well-described, but ketonemia, elevated urinary nitrogen excretion, and reduced gluconeogenic amino acid production result after a duration of fasting for the duration of pregnancy.

Pregnancy is regularly regarded a time of “accelerated starvation” due to the extend in insulin resistance, with an extended chance for creating ketonuria and ketonemia. This physiologic alternate is important to reflect on consideration on in the putting of weight loss for the duration of pregnancy due to the fact maternal ketonemia or ketonuria may also as a result be related with odd fetal increase or later neurocognitive development.

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A woman's pre-pregnancy BMI determines the total quantity of weight obtain and fee of weight acquire at some stage in pregnancy.

Women who are obese or have obesity have decrease tiers for recommended whole gestational weight attain compared to normal-weight women, yet 50% of all ladies exceed the gestational weight reap recommendations.

One finds out about located that women who obtain weight in the vary for their BMI throughout pregnancy have fewer adverse perinatal results than those gaining above the described thresholds.

Check Your Progress

1. What are the extra dietary requirements of a female in the pre-pregnancy stage?
2. What are the important nutrients required during pregnancy?
3. Why are folic acid and Omega-3 unsaturated fats required during pregnancy?

3.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A female needs to in take an extra 350 calories, 0.5 g of protein during first trimester and 6.9 g all through second trimester and 22.7 g for the duration of third trimester of pregnancy.
2. The important nutrients required during pregnancy are folic acid, omega 3 fatty acids, iron, vitamin a and calcium along with rich fibrous vegetable
3. Folic acid is required as Neural cylinder abandons (NTD) are infections identified with folic corrosive lacks and influences more than 2,500 babies conceived in the United States each year. NDT are birth deformities of the spine, mind, or spinal line.

Omega-3 unsaturated fats are required for physiological capacities, for example, vitality stockpiling, cell multiplication, control of irritation, and cell layer improvement.

3.7 SUMMARY

- Nutrition counselling is a cornerstone of prenatal care for all female throughout pregnancy. A woman's dietary reputation now not solely influences her health, but additionally pregnancy consequences and the health of her foetus-neonate.
- Physiological modifications all through being pregnant alter the regular degrees of numerous laboratory values.

- Both total red blood cells mass and plasma extent increase, but plasma extent will increase to a higher extent resulting in haemodilution and anaemia during pregnancy.
- Pregnancy is physiologically and nutritionally a rather stressful period. Extra meals is required to meet the requirements of the foetus.
- A female prepares herself to meet the nutritional demands with the aid of increasing her very own body fat deposits in the course of pregnancy.
- Pregnancy is a stressful physiological state. In India, it is observed that diets of ladies from the low socioeconomic groups are similar throughout pre-pregnant, pregnant and lactating periods. Consequently, there is extensive maternal malnutrition main to excessive prevalence of low start weight infants and very excessive maternal mortality.
- Additional meals are required to enhance weight reap in being pregnant (10-12 Kg) and beginning weight of infants (about three Kg).
- The everyday food regimen of a female need to contain an extra 350 calories, 0.5 g of protein during first trimester and 6.9 g all through second trimester and 22.7 g for the duration of third trimester of pregnancy
- Some micronutrients are in particular required in greater quantities at some point of these physiological periods. Folic acid, taken for the duration of the pregnancy, reduces the chance of congenital malformations and increases the birth weight
- The pregnant/lactating lady have to consume a significant range of meals to make certain that her own nutritional wishes as well as these of her growing foetus are met.
- There is no precise desire to alter the normal dietary pattern. However, the volume and frequency of utilization of the top-notch meals must be increased.
- Wrong meals beliefs and taboos ought to be discouraged. The most essential food protection problem is microbial meals borne illness and its prevention all through being pregnant is one of the important public health measure. Avoiding contaminated foods is necessary shielding measure in opposition to food borne illness.
- Accomplishing and keeping up a sound healthful status amid the pre-pregnant period is fundamental for expanded ripeness and accomplishing a great pregnancy. Factors, for example, keeping up a sound bodyweight and devouring satisfactory measures of folate and omega-3 unsaturated fats enhance results, while introduction to liquor, caffeine, and ecological poisons can adversely affect wellbeing.
- In any developing nations, the maternal malnutrition is on rise. Ensuring every pregnant woman receives ample nutrition should be of utmost importance. There are various including socio economic, environment factors that affect the maternal nutritional status.

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3.8 KEY WORDS

- **Weight reap:** It refers to the compulsory weight gain during pregnancy which is about eight kg which accounts for the foetus, the placenta, amniotic fluid volume, and variations to maternal tissues (e.g., uterus, breast, blood volume).
- **Neural tube defect:** It refers to birth defects of the brain, spine, or spinal cord. They happen in the first month of pregnancy, often before a woman even knows that she is pregnant.

3.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Write short notes on:
 - a. Breastmilk
 - b. Physiological changes in pregnancy
 - c. Weight gain during pregnancy
2. What is 'accelerated starvation' in pregnancy?

Long-Answer Questions

1. What is the significance of nutrition in pregnancy?
2. What factors affect nutritional requirements of a mother during pregnancy?
3. What are the various requirements of mother during pre-conceptual pregnancy?

3.10 FURTHER READINGS

- Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.
- Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.
- Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.
- Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 4 NUTRITION IN PREGNANCY-II

NOTES

Structure

- 4.0 Introduction
- 4.1 Objectives
- 4.2 Requirements, Storage of Nutrients in Normal Pregnancy
- 4.3 Complications of Pregnancy and Nutritional Problems in Young and Too Old Expectant Mothers - Causes and Complications
- 4.4 Avoiding Pregnancy Associated Health Risk Through Nutrition- Gestational Diabetes, Iron Deficiency Anaemia and Hypertensive Disorders
- 4.5 Answers to Check Your Progress Questions
- 4.6 Summary
- 4.7 Key Words
- 4.8 Self Assessment Questions and Exercises
- 4.9 Further Readings

4.0 INTRODUCTION

Nutrition guiding is a foundation of pre-birth care for all ladies amid pregnancy. A lady's wholesome status impacts her wellbeing, as well as pregnancy results and the soundness of her embryo neonate. Doctors and other social insurance suppliers should be insightful of healthy needs during pregnancy, as they contrast essentially contrasted with non-pregnant populaces. Besides, an individualized way to deal with dietary directing that thinks about a lady's entrance to nourishment, financial status, race-ethnicity and social sustenance decisions, and weight list (BMI) is suggested. Also, a large number of the suggestions are designed for uncomplicated pregnancies, so modifications should be made when inconveniences, like gestational diabetes, emerge. A nutritionist or enrolled dietitian can help encourage dietary advising and mediations. This includes, the maternal physiological adjustments and also macronutrient and micronutrient prerequisites amid pregnancy and lactation will be audited. Different talks on these themes will incorporate various growths, corpulence in pregnancy, pregnancies after bariatric medical procedure, exceptional weight control plans, and regular exposures amid pregnancy.

4.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss nutrition in pregnancy - requirements, storage of nutrients in normal pregnancy complications of pregnancy

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- Explain nutritional problems in young and too old expectant mothers – causes and complications
- Describe how to avoid pregnancy associated health risk through nutrition-gestational diabetes
- Examine iron deficiency anemia and hypertensive disorders

4.2 REQUIREMENTS, STORAGE OF NUTRIENTS IN NORMAL PREGNANCY

Physiological changes amid pregnancy adjust the ordinary scopes of a few research facility esteems. Both aggregate red platelet mass and plasma volume increment, yet plasma volume increments to a more noteworthy degree bringing about hemodilution and weakness amid pregnancy. Thus, a hemoglobin <10.5 g/dl or a hematocrit <32% is viewed as iron deficient amid the second trimester. Serum add up to protein and egg whites likewise decline by roughly 30% contrasted with non-pregnant values. Additionally, on the grounds that estrogen builds the hepatic creation of specific proteins, there is more noteworthy protein official of corticosteroids, sex steroids, thyroid hormones, and nutrient D amid pregnancy, bringing about lower free dimensions.

Folic acid is the engineered type of the normally happening B vitamin, folate. Folic acid is the frame utilized in most vitamin enhancements and nourishment stronghold. Ordinarily strengthened nourishments incorporate bread, oat, and pasta. Folate-rich food sources are citrus organic products, dim green verdant vegetables, nuts, and liver. Folate necessities increment amid pregnancy because of quickly isolating cells identified with fetal development. Eminently, folic acid enhancements (400-800mcg every day) taken before origination can lessen the hazard for neural cylinder deserts in the fetus. In request to diminish the hazard for neural cylinder surrenders in their posterity, ladies are prescribed to take folic acid from fortified food day by day notwithstanding expending an eating routine wealthy in nourishment wellsprings of folate. Women with a past filled with a neural cylinder deformity in an earlier pregnancy should take a higher portion (4mg) of folic acid day by day for resulting pregnancies. Insufficiencies in folate have been related with megaloblastic frailty in pregnancy, however not with other pregnancy results, for example, preterm birth or stillbirths.

Iron supplements have routinely been suggested in pregnancy since iron needs about twofold amid pregnancy. A standard pre-birth vitamin contains 27 mg of natural iron. Vitamin C enhancements can help with iron assimilation, while drain and tea can hinder iron supplementation. Ladies with iron insufficiency, characterized by a ferritin level <15 µg/L, can expand their hemoglobin by 2 g/dL over a multi month time frame with an every day substitution of 60-120 mg of essential iron. Normal symptoms of iron, for example, stomach torment, obstruction, sickness, and heaving

are regularly reasons why ladies are not agreeable with iron supplementation. Iron rich nourishments incorporate red meat, pork, fish, and eggs.

Vitamin D is a fat-solvent vitamin that is principally found in strengthened drain or squeeze; normal sources incorporate eggs and fish, for example, salmon. The skin likewise makes vitamin D when it is presented to daylight. Despite the source – oral ingestion versus skin assimilation – further preparing in the liver and after that the kidney is required to make the dynamic shape, 1,25-dihydroxyvitamin D, which advances calcium ingestion from the digestive organs and in this way permits fitting bone mineralization and development. Vitamin D insufficiency is basic in pregnancy, particularly in high-chance gatherings, for example, veggie lovers, ladies who live in chilly atmospheres, and ethnic minority ladies with darker skin. Extreme vitamin D inadequacy has been related with inborn rickets and cracks. While Vitamin D levels can be estimated by means of a serum dimension of 25-hydroxy vitamin D, an ideal dimension amid pregnancy has not been set up. Moreover, there is lacking proof to prescribe screening every single pregnant lady for vitamin D insufficiency. In the event that vitamin D lack is found amid pregnancy, supplements (1000-2000 IU every day) can be given. What's more, routine vitamin D supplementation amid pregnancy to avoid preeclampsia is additionally not prescribed.

Vitamin A is essential for cell differentiation and proliferation as well as development of the spine, heart, eyes, and ears. Offspring of mothers with vitamin A deficiency have a higher mortality rate, which may be associated with decreased immune function. Although most micronutrients have a wide safety margin with little concern for teratogenic effects, vitamin A is one exception. Excessive doses of Vitamin A (>10,000 IU/day) have been associated with cranial-facial (face, palate, ears) and cardiac birth defects. The maximal supplement in pregnancy is 8000 IU/day. It is the retinol form of Vitamin A that is associated with teratogenic effects, not the carotenoid version found in food sources such as carrots.

Studies regarding the risks and benefits of fish during pregnancy can often seem contradictory. This is in part due to that that most fish contain competing benefits and risks in the forms of omega-3 fatty acids and mercury. Omega-3 fatty acids are critical for fetal brain development and have been associated with improved vision in preterm infants, as well as better cardiovascular health later in life. Higher mercury levels in children, however, have been associated with deficits in memory, learning, and behavior. Ideally, pregnant women would consume those fish that are low in mercury and high in omega-3 fatty acids such as salmon, sardines, and anchovies. High mercury fish such as shark, swordfish, tilefish, and king mackerel should be avoided. The Federal Drug Administration (FDA) and the Environmental Protection Agency (EPA) websites offer information regarding local fish and their mercury content. Available data suggest that fish-oil supplements do not confer the same health benefits as consumption of the actual fish.

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4.3 COMPLICATIONS OF PREGNANCY AND NUTRITIONAL PROBLEMS IN YOUNG AND TOO OLD EXPECTANT MOTHERS – CAUSES AND COMPLICATIONS

In this section, we will discuss the complications of pregnancy.

Multiple gestations

In twins, the maternal metabolic rate is around 10% more prominent than in singletons.

Besides, the physiological changes in a singleton pregnancy are exacerbated in different incubations. This incorporates an expansion in plasma volume which results in further abatements in hemoglobin, egg whites, and water dissolvable vitamins. There are no institutionalized wholesome rules for numerous developments, yet they have been deduced from singletons. One proposal for macronutrient arrangement is 20% protein, 40% fat, and 40% starches. It is assessed that a 40% higher-calorie diet may keep up a lady's healthful state amid a twin pregnancy. Rates of iron inadequacy pallor are 2.4-multiple times higher in twins than in singletons. Iron deficiency because of folate inadequacy is multiple times increasingly normal in twins contrasted with singletons. All things considered, a 1 mg folic acid every day supplement has been prescribed for twin developments. A few specialists suggest 1000IU of nutrient D and 2000-2500mg/d of calcium day by day for twins. Different incubations have a higher danger of difficulties, for example, untimely birth and low birth weight. Of note, these rules are viewed as temporary, as the proof to help them isn't as solid all things considered for singletons. Curiously, a weight gain of 24 pounds by 24 weeks has been related with higher rates of birth weights >2500g. Proof for dietary administration of higher request products (triplets, quadruplets, and so forth.) is missing, yet they can be overseen correspondingly to twin incubations.

Pregnancy after bariatric medical procedure isn't unprecedented as fruitfulness regularly enhances after a bariatric medical procedure methodology. Given that bariatric methodology can make inadequacies of miniaturized scale and macronutrients, a pregnancy happening after a bariatric medical procedure technique requires specific regard for wholesome status. As exironed beforehand, prerequisites for calories, nutrients, and minerals increment amid pregnancy, so healthful inadequacies in the bariatric medical procedure patient can be exacerbated amid pregnancy. The most well-known inadequacies that happen after bariatric medical procedure are nutrient B12, folate, and iron. Because absorptive strategies (e.g., Roux-en-Y gastric detour [RYGB], biliopancreatic preoccupation) have a higher hazard for wholesome lacks, closer reconnaissance in pregnancies that happen after these sorts of medical procedures is fitting. Nonetheless, confusions in supplements can likewise happen after prohibitive kind methodology (e.g.,

laparoscopic flexible gastric banding), so it might be sensible to screen all ladies who are pregnant post-bariatric medical procedure for dietary insufficiencies. Rules for screening and the board of nourishing insufficiencies amid pregnancy are adjusted from those intended for non-pregnant states and incorporate research facility testing once a trimester or like clockwork if the dimensions are ordinary. Iron inadequacy iron deficiency is much of the time a long-haul complexity of bariatric medical procedure, happening in 6% to half of patients after RYGB. In pregnancies after bariatric medical procedure, iron insufficiency pallor can be determined in the standard way to have a low mean corpuscular volume, and irregular iron investigations (e.g., low serum iron, high aggregate iron-restricting limit, and a low serum ferritin) remembering the physiologic sickliness that happens amid pregnancy. Treatment of nutrient and mineral lacks amid pregnancy, as far as portion and span, is like that of non-pregnant states.

Dietary issues

For ladies with either a past filled with or current dietary problem (e.g., anorexia nervosa, bulimia), extra inquiries in regards to their weight ought to be gotten some information about weight gain, being weighed at each pre-birth visit and the progressing changes in their body. With regard to gauging, a lady's inclination about gauging (i.e., regardless of whether she likes to see the numbers) ought to be surveyed and reported in the outline. Directing on gestational weight gain objectives is as yet critical for these ladies as weight impacts the development and advancement of the baby. Like administration before pregnancy, a cooperative group of specialists in dietary problems should proceed to oversee and treat these ladies amid the pregnancy.

Vegans

There are changing sorts of veggie lover diets, for example, ovolactovegetarian (incorporates dairy and egg items), ovo vegetarian (incorporates eggs), lactovegetarian (incorporates dairy items), and vegetarian (avoids eggs, dairy, and some other creature items). Elective protein hotspots for these ladies incorporate beans, peas, soy, nuts, nut spread, and drain and egg items. Minerals that might be insufficient in their eating regimens incorporate iron, calcium, zinc, and vitamin B12. Research center testing for these explicit supplements might be shown.

Regular Exposures

Generally, pregnant ladies were encouraged to avoid caffeine. Notwithstanding, those prior examinations that showed an expanded danger of antagonistic obstetric results, for example, premature delivery, poor fetal development, and stillbirth were liable to significant inclination. Moreover, the danger of those results happening commonly expanded with genuinely substantive portions of caffeine, for example, more noteworthy than some espresso daily. Most momentum investigate proposes that littler measures of caffeine consumption, under 200-300mg day by day, are not related with expanded perinatal hazard.

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It is especially critical that general nourishment security insurances, for example, guaranteeing meat and dairy-containing sustenance are fittingly refrigerated are pursued amid pregnancy because pregnant ladies are progressively powerless to the impacts of diseases from specific microorganisms. Guaranteeing nourishments are purified or potentially fittingly cooked can bring down the danger of procuring diseases, for example, Listeria and Toxoplasmosis. Listeria Diseases are related with expanded hazard for pregnancy complexities, for example, preterm conveyance and stillbirth. Toxoplasmosis contaminations can result in ventriculomegaly and other fetal-neonatal complications. Wearing gloves when planting may likewise diminish the danger of presentation to toxoplasmosis.

While current suggestions from expert associations don't prescribe widespread screening for lead introduction, hazard evaluation ought to be performed at the main pre-birth visit and testing of lead levels performed if any hazard factors are recognized. High lead levels have been related with a more serious danger of obstetric inconveniences, for example, unsuccessful labor, poor fetal development, and neurodevelopmental hindrance.

Nutritional Problems of Too Young and Too Old Mothers

Adolescents who become pregnant are at greater risk of various complications since they may not yet have finished growing. Pregnant adolescents who are underweight or stunted are especially likely to experience obstructed labor and other obstetric complications. There is evidence that the bodies of the still-growing adolescent mother and her baby may compete for nutrients, raising the infant's risk of low birth weight (defined as a birth weight of less than 2,500 grams) and early death.

Adolescent pregnancy is often associated with nutritional, obstetric, and perinatal health risks for teen mothers and their babies. Incomplete maternal growth heightens the risk of obstructed labor. There is evidence that competition for nutrients will favor the still-growing mother, placing offspring at risk for low micronutrient stores and low birth weight. Concurrent pregnancy and growth worsen maternal micronutrient deficiencies—iron and calcium for example. Children of adolescent mothers are also often at greater risk of poor nutritional care and feeding practices.

On the other side of the spectrum being too old is also problematic for being pregnant. Both older women and older men are more likely than younger parents to have preexisting health issues. After age 35, pregnancy raises the risks of complications such as hypertension, fetal growth restriction, and premature birth. Complications such as hypertension, diabetes mellitus, haemorrhage, pre-term delivery, stillbirth, and caesarean section delivery are three to four times more among them than among younger counterparts.

4.4 AVOIDING PREGNANCY ASSOCIATED HEALTH RISK THROUGH NUTRITION-GESTATIONAL DIABETES, IRON DEFICIENCY ANAEMIA AND HYPERTENSIVE DISORDERS

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In this section, let's discuss different nutrition related risk during pregnancy.

Table 4.1 Definitions of Anemia During Pregnancy

Trimester	Hemoglobin (g/dl)		Hematocrit (%)
First	<11.0		<33
Second	<10.5		<32
Third	<11.0		<33
Normal values for non-pregnant women	12.1 to 15.1		37-48%
Vitamin	Non-Pregnant	Pregnant*	Lactation*
Vitamin A (µg/d)	700	770	1300
Vitamin D (µg/d)	5	15	15
Vitamin E (mg/d)	15	15	19
Vitamin K (µg/d)	90	90	90
Folate (µg/d)	400	600	500
Niacin (mg/d)	14	18	17
Riboflavin (mg/d)	1.1	1.4	1.6
Thiamin (mg/d)	1.1	1.4	1.4
Vitamin B6 (mg/d)	1.3	1.9	2
Vitamin B12 (µg/d)	2.4	2.6	2.8
Vitamin C (mg/d)	75	85	120
Calcium (mg/d)	1,000	1,000	1,000
Iron (mg/d)	18	27	9
Phosphorus (mg/d)	700	700	700
Selenium (µg/d)	55	60	70
Zinc (mg/d)	8	11	12

Table 4.2 Typical Composition of Micronutrients in a Prenatal Vitamin

Component	Amount	% Daily Value for Pregnant and Lactating Women
Vitamin A	4,000 IU as beta carotene	50%
Vitamin D3	400 IU as Cholecalciferol	100%
Vitamin E	11 IU as dl-Alpha Tocopheryl acetate	37%
Folic acid	800 µg	100%
Niacin	18 mg as niacinamide	90%
Riboflavin	1.7mg as thiamin mononitrate	85%
Thiamin	1.5 mg	88%
Vitamin B6	2.6 mg as pyridoxine hydrochloride	104%
Vitamin B12	4 µg as cyanocobalamin	50%
Vitamin C	100 mg as ascorbic acid	167%
Calcium	150 mg as calcium carbonate	12%
Iron	27 mg as ferrous fumarate	150%
Zinc	25 mg as zinc oxide	167%

1. Treating Iron Deficiency Naturally During Pregnancy

During pregnancy, the heart works harder to provide adequate nourishment to the foetus. The body increases its blood volume by 30-50%.

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Due to this increase in blood volume, it is important for pregnant women to also increase their intake of folic acid and iron. This might lead you to ask the question on how to treat iron deficiency naturally during pregnancy.

Anaemia is a condition in which the body lacks sufficient amounts of red blood cells, which are needed to carry oxygen through the body.

While there are several causes of anaemia, iron deficiency is the most common.

When iron levels are low, the red blood cells are unable to carry oxygen to the body's tissues. Although it is normal to experience mild anaemia during pregnancy due to increased blood volume, severe anaemia may put you and your baby at risk of premature delivery and low birth weight.

Symptoms of anaemia during pregnancy may include the following:

- Fatigue
- Weakness
- Rapid heartbeat
- Difficulty concentrating
- Shortness of breath
- Pale skin
- Chest pain
- Light headedness
- Cold hands and feet

You may have a greater risk of developing anaemia if you are carrying multiples, have two pregnancies close together, do not eat enough iron-rich foods, or if you had heavy periods prior to pregnancy.

How To Treat Iron Deficiency Naturally During Pregnancy

If you suspect that you may have an iron deficiency, it is important to see your doctor before trying to self-diagnose. Overdosing on iron supplements can be dangerous, potentially causing liver damage amongst other problems.

Your doctor will be able to determine if you have an iron deficiency and prescribe the correct dose of iron for you to take if necessary.

If your doctor does recommend taking an iron supplement, it is important to take iron at least two hours before or four hours after taking antacids as they can interfere with iron absorption.

Keep in mind that it may take several months to a year or more to restore your iron levels, although you may start feeling better after a week or so of supplementation. You may want to schedule a follow-up appointment to have your iron levels rechecked.

You may also try including more iron-rich foods in your diet. These include dark green leafy vegetables (e.g., spinach), red meat, poultry, pork, beans, peas, dried fruit, and iron-fortified bread, cereal, and pasta.

Taking a vitamin C supplement or eating foods containing vitamin C, such as citrus fruits, strawberries, kiwi, melon, leafy green vegetables, tomatoes, and bell peppers, may also aid in iron absorption.

Keep in mind that iron found in plants is not as readily absorbed as iron found in meat. As such, when eating iron-rich plants, it is best to eat foods containing vitamin C at the same meal to aid in iron absorption. However, some individuals may not be able to easily absorb iron from food, so iron supplementation may still be recommended.

How To Treat Iron Deficiency During Pregnancy When Naturally Doesn't Work

If supplementation does not improve iron levels, there may be another cause of the anaemia, such as a disruption in iron absorption. In such cases, your doctor may prescribe antibiotics to treat a peptic ulcer, or other treatment depending on the cause. In severe cases, intravenous iron supplementation or a blood transfusion may be necessary.

If you think you may be at risk for anaemia, talk with your doctor so you can be tested at your first prenatal visit

2. Gestational Diabetes

Diabetes diagnosed during pregnancy is called gestational diabetes. Gestational diabetes occurs in about 7 percent of all pregnancies. It usually arises in the second half of pregnancy and goes away as soon as the baby is born. However, if gestational diabetes is not treated, you may experience complications.

The first step in treating gestational diabetes is to modify your diet to help keep your blood sugar level in the normal range, while still eating a healthy diet. Most women with well-controlled blood sugar deliver healthy babies without any complications.

One way of keeping your blood sugar levels in normal range is by monitoring the amount of carbohydrates in your diet. Carbohydrate foods digest and turn into blood glucose (a type of sugar). Glucose in the blood is necessary because it is the fuel for your body and nourishment your baby receives from you. However, it's important that glucose levels stay within target.

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Carbohydrates in Food

Carbohydrates are found in the following foods:

- Milk and yogurt
- Fruits and juices
- Rice, grains, cereals and pasta
- Breads, tortillas, crackers, bagels and rolls
- Dried beans, split peas and lentils
- Potatoes, corn, yams, peas and winter squash

Sweets and desserts, such as sugar, honey, syrups, pastries, cookies, soda and candy also typically have large amounts of carbohydrate.

Carbohydrates in foods are measured in units called grams. You can count how many carbohydrates are in foods by reading food labels and learning the exchange lists. The two most important pieces of information on food labels for a carbohydrate-controlled diet is the serving size and grams of total carbohydrate in each serving.

Dietary Recommendations

It is important to be meet with a registered dietitian to have your diet assessed. The dietitian will calculate the amount of carbohydrates that you need at meals and snacks. You will also be taught how to count carbohydrates.

The following are dietary recommendations that will help you maintain safe blood sugar levels:

- **Distribute your foods between three meals and two or three snacks each day**

Eating too much at one time can cause your blood sugar to rise too much. It is very important that you do not skip meals. During pregnancy, you have increased nutritional needs and your baby requires balanced nutrition.

- **Eat reasonable portions of starch**

Starchy foods eventually turn into glucose so it's important not to be excessive. However, starch should be included in every meal. A reasonable portion is about one cup of total starch per meal, or two pieces of bread.

- **Drink one cup of milk at a time**

Milk is a healthy food and an important source of calcium. However, milk is a liquid form of carbohydrate and drinking too much at one time can raise your blood sugar.

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- **Limit fruit portions**

Fruit is a healthy food, but it is high in natural sugars. You may eat one to three portions of fruit per day, but only eat one at a time. A portion of fruit is either one very small piece of fruit, half of a large piece of fruit, or about one-half cup of mixed fruit. Do not eat fruit that has been canned in syrup.

- **Breakfast matters**

Blood sugar can be difficult to control in the morning because of normal fluctuations in hormone levels.

Refined cereals, fruits and even milk may not be well tolerated in your morning meal. If your post-breakfast blood sugar level increases too much after having these foods, then you should not eat them for your breakfast. A breakfast that consists of starch plus protein is usually tolerated the best.

- **Avoid fruit juice**

It takes several fruits to make a glass of juice. Juice is a concentrated source of carbohydrate. Because it is liquid, juice can raise blood sugar quickly.

- **Strictly limit sweets and desserts**

Cakes, cookies, candies and pastries tend to have excessive amounts of carbohydrate. These foods often contain large amounts of fat and offer very little in terms of nutrition. Additionally, avoid all regular sodas and sugar-sweetened beverages.

- **Stay away from added sugars**

Don't add sugar, honey or syrup to your foods.

- **Use artificial sweeteners instead of added sugars**

The following sweeteners have been approved as safe to eat during pregnancy:

- Aspartame, which includes Equal, NutraSweet, Natra Taste
- Acesulfame K, which includes Sunett
- Sucralose, which includes Splenda

- **When a product says it's "sugar-free," take a closer look**

Products containing sugar-alcohols are often labeled "sugar-free," but they may still contain significant amounts of total carbohydrate. Look at the food label to see the grams of total carbohydrate contained.

Sugar alcohols may have a laxative effect or cause gas and bloating. The following are examples of sugar-alcohols:

- Mannitol

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- Maltitol
- Sorbital
- Xylitol
- Isomalt
- Hydrogenated starch hydrolysate

Some products labeled “sugar-free” are indeed carbohydrate-free and will not affect your blood sugar, including diet sodas and sugar-free Jell-o.

Keep food records

Be sure to record all of the foods and the amount that you eat each day, which will help you monitor your carbohydrate intake. Also, use measuring cups for accuracy when possible.

Table 4.3 Gestational Weight Gain Recommendations

Pre-pregnancy BMI	Total weight gain at term	Rate of weight gain in the 2nd and 3rd trimester; Mean (range)	
Underweight (<18.5 kg/m ²)	12.5-18 kg 28-40 lbs.	0.51 (0.44-0.58) kg/week 1 (1-1.3) lbs./week	
Normal weight (18.5-24.9 kg/m ²)	11.5-16 kg 25-35 lbs.	0.42 (0.35-0.50) kg/week 1 (0.8-1) lbs./week	
Overweight (25.0-29.9 kg/m ²)	7-11.5 kg 15-25 lbs.	0.28 (0.23-0.33) kg/week 0.6 (0.5-0.7) lbs./week	
Obesity (= 30.0 kg/m ²)	5-9 kg 11-20 lbs.	0.22 (0.17-0.27) kg/week 0.5 (0.4-0.6) lbs./week	
Component	Diagnostic testing (serum)	Prophylaxis	Treatment if deficient
Protein	Serum albumin and prealbumin	60g protein/day	Protein supplements
Vitamin A	Vitamin A, if clinically indicated	4000 IU/day in prenatal vitamin	Vitamin A not to exceed 8000 IU/day
Vitamin D	25-hydroxy vitamin D, if clinically indicated	400-800 IU/day in prenatal vitamin	Calcitriol (vitamin D) 1000 IU/day
Vitamin K	Vitamin K1, if clinically indicated	Not routinely given	Vitamin K1 1 mg/day Consult with hematologist
Folic acid	Complete blood count, red blood cell folate	600-800 µg/day in prenatal vitamin	Folic acid 1000 µg/day
Vitamin B12	Complete blood cell count, Vitamin B12	4 µg/day in prenatal vitamin	Oral vitamin B12 350 µg/day or Intramuscular 1000 µg/month Consult with hematologist
Calcium	Total and ionized calcium	250 mg/day in prenatal vitamin	Calcium citrate 1000 mg/day with Vitamin D
Iron	Complete blood count, iron, ferritin, total iron binding capacity	30 mg/day in prenatal vitamin	Ferrous sulfate 325mg twice-three times/day with vitamin C

3. Hypertensive Disorders

High blood pressure is a health concern for not only the mother but also the unborn baby. One of the most recommended ways of lowering blood pressure is by eating a balanced diet. If your symptoms all echo high blood pressure, expect your health care provider to recommend medications and diet plan after a thorough examination on your next visit. A high blood pressure diet during pregnancy is different from the usual pregnancy diet. While it may be dejecting to eat a diet low in salt, it is the best remedy to increasing blood pressure.

High blood pressure during pregnancy can deprive foetus of the oxygen and much-needed nutrients. To ascertain that developing baby is not malnourished, it is important to structure and adhere to a diet plan if a woman is identified with high blood pressure.

Diet Recommendations

Foods with lower salt and sodium content improve blood pressure.

Dietary approaches to stop hypertension (DASH diet) that encompass whole grains, fruits and vegetables, low-fat dairy and meat products is advised for women to manage blood sugar level during pregnancy. DASH diet also focuses on fulfilment of calcium, magnesium and potassium content.

Potassium in the form of bananas, beans and potatoes is advised. Calcium may be derived from dairy products.

To derive much-needed protein, foods such as lean chicken, pork, lamb, fish, beans, eggs, cheese and soy should be included in the diet.

Other essential foods include dark green leafy vegetables, blackstrap molasses, celery, broccoli, cabbage, summer squash, green beans, sprouts, oranges and asparagus.

Eating fresh and frozen foods instead of processed foods is recommended to manage high blood pressure.

Carbonated beverages, coffee and tea should be swapped with healthier juices rich in antioxidants and vitamin C. Salads, especially cucumber helps in lowering blood pressure.

Types of Blood Pressure during Pregnancy

In some cases, women suffer from high blood pressure before pregnancy, though it can also develop during pregnancy.

1. **Chronic Hypertension:** It refers to the high blood pressure development before pregnancy that lasts for more than 12 weeks after delivery.
2. **Gestational hypertension:** Gestational hypertension develops after 20 weeks of pregnancy and vanishes with delivery.

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3. **Preeclampsia:** Preeclampsia is a consequence of chronic hypertension or gestational hypertension. In this condition, pregnant women experience high blood pressure and protein in the urine after 20 weeks of pregnancy. Preeclampsia can be fatal for the mother and her baby if left untreated.

High blood pressure during pregnancy can take a toll on the mother's as well as baby's health. A diet can help you deal with the complications. Before you step forward to include any particular food in your diet, make sure that you have spoken to your dietician about the same.

The wholesome status of a lady amid pregnancy and lactation isn't basic for her wellbeing, however for who and what is to come. While a nutritionist or enrolled dietitian can help encourage dietary directing and mediations, doctors likewise should be aware of nourishing needs amid pregnancy, as they vary essentially contrasted with non-pregnant populaces. Besides, an individualized way to deal with healthful advising that considers a lady's nourishing status and weight file is suggested.

Check Your Progress

1. Name the nutrient whose excessive doses result in cranial facial and cardiac birth defects.
2. What is Listeria and toxoplasmosis diseases?
3. Give a brief statement about occurrence of normal and severe anaemia during pregnancy.
4. How often does gestational diabetes occur in all pregnancies?

4.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Excessive doses of Vitamin A (>10,000 IU/day) have been associated with cranial-facial (face, palate, ears) and cardiac birth defects.
2. Listeria Diseases are related with expanded hazard for pregnancy complexities, for example, preterm conveyance and stillbirth. Toxoplasmosis contaminations can result in ventriculomegaly and other fetal-neonatal complications. Wearing gloves when planting may likewise diminish the danger of presentation to toxoplasmosis.
3. It is normal to experience mild anaemia during pregnancy due to increased blood volume, severe anaemia may put you and your baby at risk of premature delivery and low birth weight.
4. Gestational diabetes occurs in about 7 percent of all pregnancies.

4.6 SUMMARY

- Physiological changes amid pregnancy adjust the ordinary scopes of a few research facility esteems. Both aggregate red platelet mass and plasma volume increment, yet plasma volume increments to a more noteworthy degree bringing about hemodilution and weakness amid pregnancy.
- A hemoglobin <10.5 g/dl or a hematocrit <32% is viewed as iron deficient amid the second trimester. Serum add up to protein and egg whites likewise decline by roughly 30% contrasted with non-pregnant values. Additionally, on the grounds that estrogen builds the hepatic creation of specific proteins, there is more noteworthy protein official of corticosteroids, sex steroids, thyroid hormones, and nutrient D amid pregnancy, bringing about lower free dimensions.
- Folic acid is the engineered type of the normally happening B vitamin, folate. Folic acid is the frame utilized in most vitamin enhancements and nourishment stronghold. As recommended by the Food and Drug Administration, ordinarily strengthened nourishments incorporate bread, oat, and pasta.
- Iron supplements have routinely been suggested in pregnancy since iron needs about twofold amid pregnancy. A standard pre-birth vitamin contains 27 mg of natural iron. Vitamin C enhancements can help with iron assimilation, while drain and tea can hinder iron supplementation.
- Vitamin D is a fat-solvent vitamin that is principally found in strengthened drain or squeeze; normal sources incorporate eggs and fish, for example, salmon. The skin likewise makes vitamin D when it is presented to daylight.
- Vitamin A is essential for cell differentiation and proliferation as well as development of the spine, heart, eyes, and ears.
- During pregnancy, the heart works harder to provide adequate nourishment to the foetus. The body increases its blood volume by 30-50%. Due to this increase in blood volume, it is important for pregnant women to also increase their intake of folic acid and iron. This might lead you to ask the question on how to treat iron deficiency naturally during pregnancy.
- Anaemia is a condition in which the body lacks sufficient amounts of red blood cells, which are needed to carry oxygen through the body.
- High blood pressure is a health concern for not only the mother but also the unborn baby. One of the most recommended ways of lowering blood pressure is by eating a balanced diet. If your symptoms all echo high blood pressure, expect your health care provider to recommend medications and diet plan after a thorough examination on your next visit.

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- Dietary approaches to stop hypertension (DASH diet) that encompass whole grains, fruits and vegetables, low-fat dairy and meat products is advised for women to manage blood sugar level during pregnancy.
- The wholesome status of a lady amid pregnancy and lactation isn't basic for her wellbeing, however for who and what is to come. While a nutritionist or enrolled dietitian can help encourage dietary directing and mediations, doctors likewise should be aware of nourishing needs amid pregnancy, as they vary essentially contrasted with non-pregnant populaces. Besides, an individualized way to deal with healthful advising that considers a lady's nourishing status and weight file is suggested.

4.7 KEY WORDS

- **Cranial-facial defects:** It refers to the diverse group of deformities in the growth of the head and facial bones.
- **Gestational weight gain:** It refers to the amount of weight gained between conception and just before the birth of the infant.
- **Hypertensive Disorders:** It refers to the *disease* of pregnancy, also known as maternal hypertensive disorder which is a group of diseases that includes *preeclampsia*, eclampsia, gestational hypertension, and chronic hypertension.

4.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answers Questions

1. What is hypertensive disorders?
2. What are the types of blood pressure during pregnancy?
3. What are dietary recommendations for gestational diabetes?

Long-Answer Questions

1. How do you cause anaemia in pregnancy? How do you treat it?
2. What are the requirements and storage of nutrients during pregnancy?
3. What are the dietary recommendations for a normal pregnancy? Explain.

4.9 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed*. New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

Websites

<http://www.fao.org/docrep/007/y5740e/y5740e08.htm>

http://web.worldbank.org/archive/website01213/WEB/0__CO-82.HTM

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BLOCK - II
**VACCINATION, NUTRITION IN LACTATION,
INFANCY AND PRESCHOOL**

**UNIT 5 PREGNANCY,
VACCINATION AND TESTS**

Structure

- 5.0 Introduction
- 5.1 Objectives
- 5.2 Immunization Schedule During Pregnancy
- 5.3 Basic Tests During Pregnancy
- 5.4 Answers to Check Your Progress Questions
- 5.5 Summary
- 5.6 Keywords
- 5.7 Self Assessment Questions and Exercises
- 5.8 Further Readings

5.0 INTRODUCTION

Immunization is the procedure whereby an individual is made immune or resistant to an infectious disease, usually by way of the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person towards subsequent contamination or disease.

Immunization is a verified tool for controlling and eliminating life-threatening infectious illnesses and is estimated to avert between 2 and 3 million deaths every year. It is one of the most cost-efficient health investments, with tested techniques that make it reachable to even the most hard-to-reach and prone populations. It has truly described goal groups; it can be delivered efficaciously thru outreach activities; and vaccination does no longer require any main way of life change. In this unit, you will learn about immunization and tests which must be taken during pregnancy.

5.1 OBJECTIVES

After going through this unit, you will be able to:

- Elaborate upon pregnancy and vaccination
- Discuss Immunization schedule
- Describe tests during pregnancy - measles, mumps, rubella (MMR) vaccine-Tdap vaccine.

5.2 IMMUNIZATION SCHEDULE DURING PREGNANCY

Antibodies can help shield both you and your infant from immunization preventable illnesses. Amid pregnancy, immunized moms pass on contamination battling proteins called antibodies to their infants.

Antibodies give some resistance (security) against specific maladies amidst their initial couple of long periods of life, when your child is still too youthful to even consider getting inoculated. It additionally gives critical insurance to you all through your pregnancy.

To ensure yourself and your infant, it's critical to comprehend which antibodies you may require previously, amidst, and after your pregnancy.

In this section, you'll discover answers to normal inquiries concerning antibodies for pregnant ladies.

Prior to pregnancy:

Rubella: Rubella amid pregnancy can cause genuine birth surrenders. It that can prompt passing of harmful ailments before birth to the child. It's imperative to get the antibody before you attempt to get pregnant.

Hepatitis B: If a lady has hepatitis B contamination amid pregnancy, it can go to the child amid birth. Hepatitis B can prompt genuine, progressing medical issues for the youngster.

During pregnancy, the flu vaccine

Getting inoculated against this season's cold virus is essential in light of the fact that pregnant ladies are at greater risk for genuine difficulties from influenza. Influenza can likewise cause difficult issues like early work and conveyance, which can influence the child's wellbeing.

Notwithstanding ensuring the unborn child, getting seasonal influenza shot amid pregnancy makes it more outlandish that infants will get this season's flu virus for a while after they're conceived — and that brings down their danger of genuine entanglements like pneumonia (lung disease).

Whooping cough vaccine

Getting inoculated against challenging hack shields youthful infants from challenging hack before they're mature enough to get immunized themselves. Majority of infants who get challenging hack wind up in the doctor's facility — and the illness can be perilous.

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The immunization can be given anytime amid pregnancy, yet specialists suggest getting the antibody as ahead of schedule as conceivable in the third trimester (somewhere in the range of 27 and 36 weeks of pregnancy). The challenging hack immunization is additionally prescribed for different grown-ups who invest energy with your infant.

National Immunization Schedule

India's UIP grant free vaccines in opposition to eleven existence threatening illnesses - Tuberculosis, Diphtheria, Pertussis, Tetanus, Polio, Hepatitis B, Pneumonia and Meningitis due to Haemophilus Influenzae type b (Hib), Measles, Rubella, Japanese Encephalitis (JE) and Rotavirus diarrhoea. (Rubella, JE and Rotavirus vaccine in pick out states and districts)

Immunization is one of the most essential and cost effective techniques for the prevention of childhood diseases and disabilities and is therefore a basic need for all children. The following schedule has been recommended via the Ministry of Health, Govt. of India and is one of the most broadly observed through the child fitness care providers.

Table 5.1 Vaccination Guide by Ministry of Health, Government of India

Vaccine	When to give	Dose	Route	Site
For Pregnant Women				
TT -1	early pregnancy	0.5ml	intra muscular	Upper arm
TT -2	4 weeks after 1st dose of TT*	0.5ml	intra muscular	Upper arm
TT booster	If received 2 TT doses in a pregnancy within the last 3yrs	0.5ml	intra muscular	Upper arm
For Infants				
BCG	At birth or as early as possible till 1 year of age	0.1ml (0.05ml until 1 month age)	Intra-dermal	Left Upper Arm
Hepatitis B - Birth dose	At birth or as early as possible within 24 hours	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
OPV -0	At birth or as early as possible within first 15 days	2 drops	Oral	Oral
OPV -1,2,3,	6 weeks, 10 weeks & 14 weeks	2 drops	Oral	Oral
DPT- 1,2,3,	6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Hepatitis B- 1, 2, &3	6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Pentavalent vaccine - 1, 2 & 3**	6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of mid-thigh
Measles	9 completed months - to 12 months. Give up to 5yrs if not received at 9 - 12 months age	0.5 ml	Sub-cutaneous	Right upper arm
Vitamin A (1st dose)	At 9 completed months with measles	1ml (1lakh IU)	Oral	Oral

Japanese Encephalitis (1st Dose)***	At 9 completed months (under consideration)	0.5 ml	Sub-cutaneous	Left Upper Arm
For Children				
DPT booster 1	16- 24 months	0. 5 ml	Intra-muscular	Antero-lateral side of mid-thigh
OPV Booster	16-24 months	2 drops	Oral	Oral
Japanese Encephalitis*** (if applicable)	16-24 months	0.5 ml	Sub-cutaneous	Left Upper Arm
Measles - 2nd dose	16 - 24 months age	0.5 ml	Sub-cutaneous	Right upper arm
Vitamin A*** (2nd to 9th dose)	18 months (2nd dose). Then, one dose every 6 months up to the age of 5 years.	2 ml (2 lakh IU)	Oral	Oral
DT booster	5- 6 years	0.5 ml	Intra-muscular	Upper arm
TT	10 years & 16 years	0.5 ml	Intra-muscular	Upper arm

* Give TT-2 or Booster doses before 36 weeks of pregnancy. However, give these even if more than 36 weeks have passed. Give TT to a women in labour if, she has not previously received TT.

** Pentavalent vaccine introduced instead of DPT and Hepatitis B 1,2,3 in select states.

*** JE vaccine at select endemic districts

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Rotavirus vaccine as part of Universal Immunization Programme

Rotavirus is one of the main causes of extreme diarrhoea and loss of life amongst teens much less than 5 years of age, and that every year nearly 80,000 to one lakh children die in the country due to Rotavirus diarrhoea, and about 9 lakh teens are admitted to medical institution due to episodes of extreme diarrhoea with 32.7 lakh cases of OPD. The introduction of Rotavirus vaccine will enable to without delay tackle the problem of diarrheal deaths. The vaccine is being brought in pick out states i.e. Andhra Pradesh, Haryana, Himachal Pradesh, Odisha, Assam, Tripura, Madhya Pradesh, Rajasthan and Tamil Nadu. It will be improved to the whole us of a in a phased manner. The Rotavirus vaccine has been developed indigenously, under a public-private partnership by means of the Ministry of Science and Ministry of Health and Family Welfare.

Pentavalent vaccines

The pentavalent vaccine is an aggregate of DPT (diphtheria, Pertussis/whooping cough and tetanus), Hepatitis B and HIV vaccines. DPT and Hepatitis B vaccines are already a section of the immunisation programme. They are being changed via pentavalent vaccine in a phased manner in the country. Each pentavalent vaccine consists of 0.5ml dose that will be given intramuscularly in the mid-thigh vicinity through syringes.

Table 5.2 Pentavalent Vaccination Schedule

Vaccine	Schedule
BCG, Hep B birth dose, OPV-O	At Birth
Pentavalent (DPT + Hep B + Hib), OPV	6 weeks, 10 weeks and 14 weeks
Measles and Vitamin A	9-12 months
DPT booster, OPV booster, Measles2*	16-24 months
DPT booster	5-6 years

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Pneumococcal Conjugate Vaccine (PCV) under Universal Immunisation Programme

The Health Ministry has authorized the introduction of Pneumococcal Conjugate Vaccine (PCV) underneath Universal Immunisation Programme. Himachal Pradesh will be among 4 other states the place Pneumonia Vaccines will be introduced alongside with Bihar, Uttar Pradesh, Rajasthan and Madhya Pradesh in a deliberate manner from 2017.

IAP (Indian Academy of Paediatrics) Recommendations

Indian Academy of Paediatrics, the greatest expert agency of paediatricians in our country, utterly endorses and helps the countrywide schedule. It supplements the above schedule further, with extra vaccines such as Hepatitis B vaccine to be given in three doses (at birth, one month and six months of age.) and MMR (Measles, Mumps and Rubella vaccine) at about 15 to 18 months of age. It should be remembered that even though rubella can also show up to be a slight illness, it has a serious conceivable to motive congenital defects in a baby, whose mom is not blanketed towards rubella and catches the infection throughout early pregnancy.

Table 5.3 Vaccination by Age

Age	Vaccines
Birth	BCG, OPV 0, Hepatitis B -1
6 weeks	IPV-1, DTwP-1, Hepatitis B -2, Hib -1, Rotavirus 1, PCV 1
10 weeks	DTwP-2, IPV 2, Hib -2, Rotavirus 2, PCV 2
14 weeks	DTwP-3 , IPV-3 , Hib -3, Rotavirus 3, PCV 3
6 months	OPV 1, Hep B 3
9 months	OPV 2, MMR-1
9-12 months	Typhoid Conjugate Vaccine
12 months	Hep-A 1
15 months	MMR 2, Varicella 1, PCV Booster
16-18 months	DTwP B 1 / DTaP booster -1, IPV B 1, Hib booster 1
18 months	Hep-A 2
2 years	Booster of Typhoid Conjugate Vaccine
4 - 6 years	DTwP B 2 / DTaP booster -2, OPV 3, MMR 3, Varicella 2,
10 - 12 years	Tdap / Td, HPV (Only for females, three doses at 0, 1-2 and 6 months)

Immunization is a way of defending the human body against infectious diseases via vaccination. Immunisation prepares our bodies to fight towards illnesses in case we come into contact with them in the future.

Babies are born with some herbal immunity which they get from their mother and thru breastfeeding. This step by step wears off as the baby's own immune device starts to develop. Having your infant immunized offers more protection towards ailments which can kill.

Only very few children and youth boost aspect results after a vaccination. For example, after the DPT injection, the toddler may additionally have pain at the web page of the injection and may additionally even increase fever.

After the measles injection, measles like rashes can also appear. These are normal. Very rarely, kids can have allergic reactions straight after immunization. Also

if the child develops excessive fever or loses consciousness, a medical doctor have to be consulted immediately. People giving immunizations are trained to deal with allergic reactions and if the child is dealt with quickly, he or she will recover fully.

Continue the vaccinations as per the agenda and whole the direction as quickly as possible. The child will be wholly protected only after s/he has obtained 1 BCG injection, 3 DPT injections, 3 OPV doses and 1 measles injection. Hence it is very important to take the toddler for the vaccination at the correct time and to make certain that all the vaccinations are given.

There are very few reasons why a child ought to now not be immunized. Ordinarily common ailments like a bloodless or a diarrhoea are no longer impediments against getting the toddler vaccinated.

There are certain situations though, where you must let the health practitioner comprehend of the child's conditions. Following are some of them:

- The child has a high fever
- S/He has had a terrible reaction to some other immunization
- S/He has had an extreme reaction after consuming eggs
- S/Has had a convulsion (fits) in the past. (With the right advice, teens who have had matches in the previous can be immunized)
- S/He has had, or is having, remedy for cancer
- S/He has any sickness which influences the immune system, for example, HIV or AIDS
- S/He is taking any medicine which influences the immune system, for example, immunosuppressant (given after organ transplant or for malignant disease) or high-dose steroids

Vaccines like all other drug treatments undergo big and rigorous checks regarding their safety. Only after they have been located to be protected that they are delivered for universal vaccination programs. Each vaccine is constantly checked even after it has been added and motion is taken if it is needed. If a vaccine is not secure it is now not used.

BCG is given on the left upper arm to hold uniformity and for helping surveyors in verifying the receipt of the vaccine.

BCG is given on the left higher arm to maintain uniformity and for helping surveyors in verifying the receipt of the vaccine.

This is because the skin of new-borns is thin and an intradermal injection of 0.1 ml can also ruin the pores and skin or penetrate into the deeper tissue and cause local abscess and enlarged axillary lymph nodes. Most youngsters gather herbal clinical/ sub-clinical tuberculosis infection through the age of one year. This too protects against extreme types of childhood tuberculosis e.g. TB meningitis and military disease.

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5.3 BASIC TESTS DURING PREGNANCY

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In this section, you will learn about the basic tests during pregnancy more typical tests performed amid pregnancy:

1. First Trimester Prenatal Screening Tests

First trimester screening is a mix of foetal ultrasound and maternal blood testing performed amid the primary trimester of pregnancy. This screening procedure can decide the danger of the embryo having certain birth abandons. Screening tests might be utilized alone or in mix with different tests.

There are three sections of first trimester screening:

Ultrasound test for foetal nuchal translucency (NT). Nuchal translucency screening utilizes an ultrasound test to analyse the zone at the back of the foetal neck for expanded liquid or thickening.

Two maternal serum (blood) tests. The blood tests measure two substances found in the blood of every single pregnant lady:

Pregnancy-related plasma protein screening (PAPP-A)- - a protein delivered by the placenta in early pregnancy. Anomalous dimensions are related with an expanded hazard for chromosome variation from the norm.

Human chorionic gonadotropin (hCG)- - a hormone delivered by the placenta in early pregnancy. Anomalous dimensions are related with an expanded hazard for chromosome variation from the norm.

At the point when utilized together as first trimester screening tests, nuchal translucency screening and maternal blood tests have a more prominent capacity to decide whether the embryo may have a birth deformity, for example, Down disorder (trisomy 21) and trisomy 18.

In the event that the consequences of these first trimester screening tests are strange, hereditary guiding is suggested. Extra testing, for example, chorionic villus inspecting, amniocentesis, sans cell foetal DNA, or different ultrasounds might be required for precise determination.

2. Second Trimester Prenatal Screening Tests

Second trimester pre-birth screening may incorporate a few blood tests, called various markers. These markers give data about a lady's danger of having an infant with certain hereditary conditions or birth absconds. Screening is normally performed by taking an example of the mother's blood between the fifteenth and twentieth long stretches of pregnancy (sixteenth to eighteenth is perfect). The numerous markers include:

Alpha-fetoprotein screening (AFP). This blood test estimates the dimension of alpha-fetoprotein in the moms' blood amid pregnancy. AFP is a protein ordinarily

delivered by the foetal liver and is available in the liquid encompassing the hatchling (amniotic liquid), and crosses the placenta into the mother's blood. The AFP blood test is likewise called MSAFP (maternal serum AFP).

Strange dimensions of AFP may flag the following:

- Open neural cylinder absconds (ONTD, for example, spina bifida)
- Down disorder
- Other chromosomal anomalies
- Imperfections in the stomach mass of the embryo
- Twins-more than one hatchling is making the protein
- A miscounted due date, as the dimensions change all through pregnancy hCG. This is human chorionic gonadotropin hormone (a hormone created by the placenta) Estriol. This is a hormone created by the placenta Inhibin. This is a hormone created by the placenta

Irregular test consequences of AFP and different markers may show the requirement for extra testing. Generally, an ultrasound is performed to affirm the dates of the pregnancy and to take a gander at the foetal spine and other body parts for deformities. An amniocentesis might be required for exact analysis.

Numerous marker screening isn't indicative. This implies it isn't 100 percent precise, and is just a screening test to figure out who in the populace ought to be offered extra testing for their pregnancy. There can be false-positive outcomes - demonstrating an issue when the baby is really solid or false negative outcomes - showing a typical outcome when the hatchling really has a medical issue.

At the point when a lady has both first and second trimester screening tests played out, the capacity of the tests to identify a variation from the norm is more prominent than utilizing only one screening autonomously. Almost all instances of Down Syndrome can be identified when both first and second trimester screening are utilized.

Amniocentesis

An amniocentesis is a technique used to get a little example of the amniotic liquid that encompasses the baby to analyse chromosomal disarranges and open neural cylinder surrenders (ONTDs), for example, spina bifida. Testing is accessible for other hereditary deformities and scatters relying upon the family ancestry and accessibility of research facility testing at the season of the technique. An amniocentesis is by and large offered to ladies between the fifteenth and twentieth long stretches of pregnancy who are at expanded hazard for chromosome variations from the norm, for example, ladies who are over age 35 years old at conveyance, or the individuals who have had an unusual maternal serum screening test, demonstrating an expanded hazard for a chromosomal irregularity or neural cylinder deformity.

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Chorionic villus inspecting (CVS)

Chorionic villus inspecting (CVS) is a pre-birth test that includes taking an example of a portion of the placental tissue. This tissue contains indistinguishable hereditary material from the embryo and can be tried for chromosomal anomalies and some other hereditary issues. Testing is accessible for other hereditary imperfections and disarranges relying upon the family ancestry and accessibility of research facility testing at the season of the method. In contrast with amniocentesis (another kind of pre-birth test), CVS does not give data on neural cylinder deformities, for example, spina bifida. Consequently, ladies who experience CVS additionally require a subsequent blood test between 16 to 18 weeks of their pregnancy, to screen for neural cylinder deserts.

Foetal observing

Amid late pregnancy and amid work, your specialist might need to screen the foetal pulse and different capacities. Foetal pulse observing is a technique for checking the rate and mood of the foetal heartbeat. The normal foetal pulse is somewhere in the range of 110 and 160 beats for every moment. The foetal pulse may change as the hatchling reacts to conditions in the uterus. An unusual foetal pulse or example may imply that the hatchling isn't getting enough oxygen or there are different issues. An anomalous example likewise may imply that a crisis or caesarean conveyance is required.

Glucose challenge and a glucose resistance tests

The underlying 1-hour test is a glucose challenge test. In the event that the outcomes are irregular, a glucose resilience test is finished.

A glucose resistance test, generally led in the 24 to 28 weeks of pregnancy, measures dimensions of sugar (glucose) in the mother's blood. Unusual glucose levels may demonstrate gestational diabetes.

Gathering B strep culture

Gathering B Streptococcus (GBS) are microscopic organisms found in the lower genital tract of around 25 percent all things considered. GBS disease as a rule causes no issues in ladies before pregnancy, however can cause genuine sickness in the mother amid pregnancy. GBS may cause chorioamnionitis (a serious contamination of the placental tissues) and baby blues disease. Urinary tract diseases caused by GBS can prompt preterm work and birth, or pyelonephritis and sepsis.

GBS is the most widely recognized reason for hazardous diseases in babies, including pneumonia and meningitis. Infants get the disease amid pregnancy or from the mother's genital tract amid work and conveyance.

Ultrasound

Image of a doctor playing out an ultrasound on an eager mother. An ultrasound check is a symptomatic system which utilizes high-recurrence sound waves to

take a picture of the inner organs. A screening ultrasound is now and then done over the span of a pregnancy to check typical foetal development and confirm the due date. Ultrasounds might be performed at different occasions all through pregnancy for various reasons:

3. In the principal trimester

- To set up the dates of a pregnancy
- To decide the quantity of embryos and recognize placental structures
- To analyse an ectopic pregnancy or unnatural birth cycle
- To look at the uterus and other pelvic life systems
- Now and again to identify foetal variations from the norm
- Mid-trimester (now and again called the 18 to multi week check)
- To affirm pregnancy dates
- To decide the quantity of babies and look at the placental structures
- To aid pre-birth tests, for example, an amniocentesis
- To analyse the foetal life structures for nearness of anomalies
- To check the measure of amniotic liquid
- To analyse blood stream designs
- To watch foetal conduct and movement
- To analyse the placenta
- To quantify the length of the cervix
- To screen foetal development

Third trimester

- To screen foetal development
- To check the measure of amniotic liquid
- As a component of the biophysical profile
- To decide the situation of a baby
- To evaluate the placenta

Stomach ultrasound

In a stomach ultrasound, gel is connected to the mid-region and the ultrasound transducer floats over the gel on the midriff to make the picture.

Transvaginal ultrasound

In a transvaginal ultrasound, a littler ultrasound transducer is embedded into the vagina and leans against the back of the vagina to make a picture. A transvaginal ultrasound delivers a more keen picture and is frequently utilized in early pregnancy.

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Hereditary screening

Numerous hereditary variations from the norm can be analysed before birth. Your specialist or birthing specialist may suggest hereditary testing amid the pregnancy on the off chance that you or your accomplice have a family ancestry of hereditary issue as well as you have had an embryo or child with a hereditary anomaly.

Instances of hereditary issue that can be analysed before birth incorporate the accompanying:

- Cystic fibrosis
- Duchenne strong dystrophy
- Haemophilia A
- Thalassemia
- Sickle cell sickliness
- Polycystic kidney infection
- Tay-Sachs infection

Check Your Progress

1. What is immunization?
2. Which two immunizations are a must prior to pregnancy?

5.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Immunization is the procedure whereby an individual is made immune or resistant to an infectious disease, usually by way of the administration of a vaccine. Vaccines stimulate the body's own immune system to protect the person towards subsequent contamination or disease
2. Rubell and Hepatitis B are the two immunization a must prior to pregnancies.

5.5 SUMMARY

- Immunization is the procedure whereby a man or woman is made immune or resistant to an infectious disease, generally by way of the administration of a vaccine.
- Vaccines stimulate the body's very own immune machine to defend the individual towards subsequent infection or disease.
- Immunization is a confirmed tool for controlling and eliminating life-threatening infectious ailments and is estimated to ward off between 2 and

three million deaths every year. It is one of the most low-priced health investments, with tested techniques that make it reachable to even the most hard-to-reach and inclined populations. It has truly described intention groups; it can be delivered effectively via outreach activities; and vaccination does no longer require any primary way of life change.

- Indian Academy of Paediatrics, the greatest expert agency of paediatricians in our country, utterly endorses and helps the countrywide schedule. It supplements the above schedule further, with extra vaccines such as Hepatitis B vaccine to be given in three doses (at birth, one month and six months of age.) and MMR (Measles, Mumps and Rubella vaccine) at about 15 to 18 months of age.
- Babies are born with some herbal immunity which they get from their mother and thru breastfeeding. This step by step wears off as the baby's own immune device starts to develop. Having your infant immunized offers more protection towards ailments which can kill.
- Only very few children and youth boost aspect results after a vaccination. For example, after the DPT injection, the toddler may additionally have pain at the web page of the injection and may additionally even increase fever.
- There are certain situations though, where you must let the health practitioner comprehend of the child's conditions.
- Vaccines like all other drug treatments undergo big and rigorous checks regarding their safety. Only after they have been located to be protected that they are delivered for universal vaccination programs. Each vaccine is constantly checked even after it has been added and motion is taken if it is needed. If a vaccine is not secure it is now not used.
- The tests for pregnancies vary with the trimesters.

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5.6 KEYWORDS

- **Human chorionic gonadotropin (hCG):** It refers to a hormone delivered by the placenta in early pregnancy
- **AFP (Alpha-fetoprotein):** A protein ordinarily delivered by the foetal liver and is available in the liquid encompassing the hatchling (amniotic liquid), and crosses the placenta into the mother's blood
- **Ultrasound:** It is a symptomatic system which utilizes high-recurrence sound waves to take a picture of the inner organs.
- **Amniocentesis:** It is a technique used to get a little example of the amniotic liquid that encompasses the baby to analyse chromosomal disarranges and open neural cylinder surrenders (ONTDs, for example, spina bifida

5.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short-Answer Questions

1. What are three stages of first trimester screening?
2. What is AFP? What is strange dimensions of AFP?
3. Define
 - (i) Whooping cough vaccine
 - (ii) CVP

Long-Answer Questions

1. Explain the various vaccines to be taken during pregnancy.
2. Explain the different tests to be taken during pregnancy.

5.8 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

Websites

<http://vikaspedia.in/health/child-health/immunization>

https://www.who.int/topics/infant_nutrition/en/

UNIT 6 NUTRITION IN LACTATION

Structure

- 6.0 Introduction
- 6.1 Objectives
- 6.2 Breast Milk and its Benefits
 - 6.2.1 Physiological Adjustments During Lactation
- 6.3 Lactation in Relation to Growth and Health of Infants
- 6.4 Efficiency of Milk Production
- 6.5 Diet in Lactation
- 6.6 Answers to Check Your Progress Questions
- 6.7 Summary
- 6.8 Key Words
- 6.9 Self Assessment Questions and Exercises
- 6.10 Further Readings

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6.0 INTRODUCTION

Breast feeding is associated with better cognitive development of youngsters and may also supply some long-term fitness benefits. Breast-feeding in India is frequent amongst the rural and urban poor, being less so among the city middle and top classes. The poorer agencies proceed breastfeeding for longer length than the trained higher and center income groups. The economically advantaged or the working mother tends to discontinue breast-feeding early. A toddler should be solely breast-fed solely up to 6 months and complementary meals should be introduced thereafter. Breast-feeding can be persisted as lengthy as possible, even up to 2 years. Demand feeding helps in preserving lactation for a longer time. If infants are quiet or sleep for 2 hours after a feed and exhibit adequate weight gain, feeding might also be assumed as adequate. Breast-fed babies do not want additional water. Feeding water reduces the breast milk consumption and will increase the threat of diarrhea and should, therefore, be avoided. Giving extra water is needless even in warm climate. In this unit, you will study in detail the aspects of nutrition in lactation.

6.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss nutrition in lactation
- Describe the physiological adjustments during lactation
- Discuss the lactation in relation to growth and health of infants
- Explain the efficiency of milk production
- Discuss diet during lactation

6.2 BREAST MILK AND ITS BENEFITS

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Breast-milk incorporates all fundamental nutrients wanted for the infant; it provides the satisfactory diet and protects the baby from infections. Breast-milk is a natural food and is easily digested and absorbed via the toddler as in contrast to system milk prepared from other sources. Colostrum, which is the milk secreted at some point of the first 34 days after child birth, is rich in proteins, minerals, vitamins nutrition A and antibodies. In addition, it has a laxative impact as well. Breast-feeding helps in decreasing fertility and facilitates spacing of children. Lactation presents emotional pride to the mom and the infant. Recent evidence suggests that human milk may additionally confer some long-term benefits such as decreased threat of certain autoimmune diseases, inflammatory bowel disease, obesity and associated problems and probable some cancers. Therefore, breast milk is the first-rate milk for the newborn and growing infant.

Breast-milk has countless special elements such as increase factors, enzymes, hormones and anti-infective factors. The amount of milk secreted will increase progressively in the first few days after delivery, accomplishing the top at some stage in the second month, at which degree it is maintained until about 6 months of age. A common Indian girl secretes about 750 ml of milk per day throughout the first 6 months and 600 ml/day because of this up to one year. Many imperative factors are in targeted amounts in colostrum as in contrast to mature milk, compensating for the low output during early lactation. Breast-milk presents good quality proteins, fat, vitamins, calcium, iron and different minerals up to 4-6 months. In fact, best of some of the vitamins can be extended by using supplementing the weight loss program of the mother with nutrients. Growth and overall performance of majority of the breast-fed toddlers is fine up to 6 months of age. Breast feeding is related with better cognitive improvement perchance due to the high content of docosaehaenoic acid (DHA) which performs a vital role in intelligence development.

Mother-infant contact ought to be hooked up as early as possible (immediately after birth) by means of permitting the toddler to suck at the breast. Mothers can breast-feed from as early as 30 minutes after delivery. Colostrum be made handy to the toddler right now after birth. Feeding honey, glucose, water or dilute milk system before lactation must be averted and the child ought to be allowed to suck, which helps in setting up lactation. Colostrum should not be discarded, as is occasionally practiced. Composition of breast-milk relies upon to some extent on maternal nutrition. In general, even the undernourished moms can efficaciously breast-feed. But in the case of extreme malnutrition, each the fine and volume of breast-milk may also be affected. Protein content of breast-milk seems to be lots less affected as compared to fats in malnutrition. Concentration of water-soluble vitamins as properly as fats soluble nutrition A (beta-carotene) is influenced through the high-quality of the maternal diet. Supplementation of vitamins

A and B-complex to lactating moms increases the stages of these nutritional vitamins in breast-milk. Zinc and iron from breast-milk are better absorbed than from different meals sources. Trace thing composition of breast-milk, however, is no longer affected with the aid of the mother's dietary status.

Diseases and death among breast-fed babies are plenty decrease than those amongst formula-fed infants. Breast-feeding protects against diarrhea and higher respiratory tract infections. The bifid us factor in breast-milk promotes the natural intestine flora. The intestine plant life and the low pH of breast-milk inhibit the boom of pathogens. Breast-milk has immunoglobulins (IgA), lactoferrin, lactoperoxidase and complements which protect the child from various infections. Antibodies to E-coli and some viruses are found in breast milk, which protect the gut mucosa. Breast-feeding also protects toddlers from vulnerability to allergic reactions.

Since, drugs (antibiotics, caffeine, hormones and alcohol) are secreted into the breast-milk and ought to show harmful to the breast-fed infant, caution need to be exercised by way of the lactating mom whilst taking medicines.

HIV may additionally be transmitted from mom to toddler via breast milk. However, female living in the aid poor settings in developing nations may additionally now not have get admission to safe, hygienic and low-cost replacement feeding options. Considering the important function of breast milk in toddler growth and development, following guidelines have been proposed via National AIDS Control Organization (NACO). When substitute feeding is no longer acceptable, feasible, affordable, sustainable and safe (AFASS), one of a kind breast-feeding is advocated during the first months of life. Every effort has to be made to promote exclusive breast-feeding for up to four months in the case of HIV high quality mothers accompanied through weaning, and complete stoppage of breast feeding at six months in order to avoid transmission through breast feeding. However, such moms will be knowledgeable about the hazard of transmission of HIV through breast milk and its consequences. In addition, based on the principle of informed choice, HIV contaminated women must be advised about the hazard of HIV transmission thru breast milk and the dangers and benefits of every feeding method, with specific education in selecting the option most likely to be appropriate for their situation. In any case, blended feeding i.e. breast-feeding along with other feeds must be strictly discouraged as it will increase the danger of HIV transmission.

6.2.1 Physiological Adjustments During Lactation

Healthful requirements are expanded amid pregnancy and lactation for help of fetal and baby development and improvement alongside changes in maternal tissues and digestion. Add up to supplement needs are not really the whole of those collected in maternal tissues, results of pregnancy and lactation and those inferable from the upkeep of nonreproducing ladies. Maternal digestion is balanced through the elaboration of hormones that fill in as go between, diverting supplements to

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exceedingly maternal tissues explicit to propagation (i.e., placenta and mammary organ). It is most impossible that the elevated supplement requirements for effective multiplication can generally be met from the maternal eating routine. Prerequisites for energy yielding macronutrients increment unassumingly contrasted and a few micronutrients that are unevenly dispersed among food. Adjusted supplement usage and activation of stores regularly counterbalance upgraded needs however at times supplement lacks are hastened by propagation. There is just constrained information from very much controlled mediation examinations with dietary enhancements and with couple of special cases (press amid pregnancy and folate amid the periconceptionally period), the proof isn't solid that supplements give quantifiable advantage. More research is required and in future, consideration must be given to subject attributes that may impact capacity to meet maternal and baby requests (hereditary and natural), supplement collaborations, affectability and selectivity of estimated results and legitimate utilization of intermediary measures. Thought of these components in future investigations of pregnancy and lactation are important to give a detailed information of the connections between maternal eating routine; dietary supplementation; and fetal, newborn child and maternal wellbeing.

6.3 LACTATION IN RELATION TO GROWTH AND HEALTH OF INFANTS

It is recommended to start breast-feeding within an hour after delivery and do not discard colostrum. Breast-feed solely (not even water) for a minimal of six months if the growth of the toddler is adequate. One must continue breast-feeding in addition to nutrient-rich complementary foods (weaning foods), preferably up to 2 years. Breast-feed the infant frequently and on demand to set up and preserve good milk supply. Take a nutritionally enough eating regimen both for the duration of pregnancy and lactation. Avoid tobacco (smoking and chewing), alcohol and drugs during lactation. Ensure energetic family assist for breast-feeding.

Breast-milk on its own is not sufficient for the baby beyond 6 months of age. Introduction of food supplements (semi-solid complementary foods) alongside with breast-feeding is indispensable for toddlers after 6 months of age. Provision of enough and appropriate dietary supplements to younger youngsters prevents malnutrition. Hygienic practices ought to be observed whilst preparing and feeding the complementary food to the child; otherwise, it will lead to diarrhoea.

It is well known that breast milk is the excellent meals for an infant. Fortunately, in India, most rural mothers are capable to breast-feed their youth for extended periods. In fact, this is a boon to Indian children as otherwise the occurrence of under-nutrition amongst them would have been a lot higher. However, often, youngsters are completely breast-fed even past the age of one year in the faith that breast-milk by myself is sufficient for the infant until he/she is capable to choose up food and eat. This exercise result in under-nutrition amongst younger children.

Working mothers, on the other hand are unable to breast-feed their youngsters for longer periods, as they go to work outside.

Foods that are often fed to the infant, in addition to breast-milk, offering enough nutrients are recognised as supplementary or complementary foods. This ought to be drinks like milk or semi-solids like 'kheer' in the case of babies or stable preparations like rice etc., in the case of teenagers over the age of one year.

At birth, mother's milk by itself is enough for the infant. Requirements of all the nutrients gradually extend with the infant's growth. Simultaneously, the breastmilk secretion in the mom comes down with time. Thus, toddlers are deprived of adequate vitamins due to the twin factors of multiplied nutrient requirements and lowered availability of breast-milk. Usually, these changes show up at about 6 months of age. Hence, promoting of superior growth in infants, calls for introduction of sufficient food supplements in addition to persevered breast feeding, from two the age of 6 months onwards.

Low-cost food supplements can be organized at domestic from normally used elements such as cereals (wheat, rice, ragi, jowar, bajra, etc.); pulses (grams/dals), nuts and oilseeds (groundnut, sesame, etc.), oils (groundnut oil, sesame oil etc.) and sugar and jaggery. Such dietary supplements are easily digested by all infants, including these with severe malnutrition. The impact that only the commercially available supplementary foods are nutritious is no longer correct.

Weaning ingredients primarily based on cereal-pulse-nut and sugar/ jaggery combos will provide top quality protein, enough calories and different defensive nutrients. Since infants can't consume cumbersome complementary food, in sufficient quantities, energy-rich foods like fats and sugars should be included in such preparations. Infants can additionally be fed green leafy greens (GLVs), which are rich, but inexpensive, sources of vitamins and minerals. However, greens should be properly cleaned earlier than cooking lest the toddlers improve loose motions. Dietary fiber in green leafy veggies can, with the aid of itself, promote the bowel moves leading to loose motions in infants. Since GLVs are wealthy in dietary fiber, it is useful to at first feed solely the juice of the GLVs after cooking them properly. Infants ought to be brought to exceptional vegetables and fruits gradually. It should, however, be remembered that these dietary articles must be fully cooked and mashed before feeding. In households which can afford egg yolk and meat soup can be introduced. At about one year of age, the toddler must share the household diet.

Flours of germinated cereals, which are rich in the enzyme alpha-amylase, constitute ARFs. Even small quantities of this type of meals liquefy and decrease the bulk of the cereal-based diet. Thus, ARFs assist in growing the electricity density of weaning gruels and in decreasing its bulk as well. Mothers can add ARF to expand the digestibility of the lower priced weaning foods organized at home. Preparation of ARF is very easy and can be executed by means of moms at home.

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Preparation of Amylase Rich Food (ARF)

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- Take 250 g of wheat
- Add 2-3 volumes of water soak it for 8 hrs
- Drain excess water
- Germinate wheat in dark for 24-48 hours
- Sun dry for 5-8 hours
- Roast gently in flat pan just to remove water
- Grind and powder the grains (ARF)
- Store in airtight bottles/jars
- Add 5 g (one tea spoon) of ARF, after cooking, to every feed

Infants cannot eat large quantities of food in one sitting at a given time. So, they should be fed small quantities at frequent intervals (3-4 times a day). Also, the food should be of semi-solid consistency for easy swallowing. When such semi-solid foods are offered initially, the infant tends to spit it out. This should not be mistaken as dislike for that food. The fact is that the young infant cannot achieve full coordination needed for the act of swallowing and hence, brings out the food by movements of its tongue. Physiological maturity of swallowing the semi-solid food develops when the food is regularly given every day.

It is important to ensure that hygienic practices are scrupulously followed. All the dietary ingredients should be thoroughly cleaned. Vegetables should be washed well to remove contaminants/ parasites/ pesticides before cutting. Vegetables should preferably be steam-cooked to reduce cooking losses. At the time of preparation and feeding of the recipes, mother should observe proper personal hygiene and the utensils used for cooking should be thoroughly washed or sterilized, wherever possible. Many pre-cooked and ready-to-eat foods can be prepared for use as complementary foods. Such foods should be stored in clean bottles or tins. As feeding is likely to be time consuming, the cup or the plate from which the recipe is being fed to the infant should be kept covered to protect it from flies. Most often, diarrhoea is caused by unhygienic practices adopted by mothers. The weaning foods which are properly cleaned and well-cooked are safe even for young infants.

Breast-milk alone is not enough for infants after 6 months of age. Complementary foods should be given after 6 months of age, in addition to breast-feeding. Do not delay complementary feeding. Feed low-cost home-made complementary foods. Feed complementary food on demand 3-4 times a day. Provide fruits and well cooked vegetables. Observe hygienic practices while preparing and feeding the complementary food. Read nutrition label on baby foods carefully.

What Should Be Done if Breast-Milk is Not Adequate?

If breast-feeding fails, the infant needs to be fed animal milk or commercial infant formula.

Milk should be boiled before being fed to the baby. To start with, milk may be diluted with an equal volume of water. Full strength milk may be started from 4 weeks of age. Infants fed animal milk should receive supplements of iron and vitamin C. About 120-180 ml of milk should be fed with one teaspoon of sugar per feed, 6-8 times over the day. While reconstituting the infant formula, the instructions given on the label should be strictly followed. The feeds should be prepared and given using a sterile cup, spoon, bottles and nipples taking utmost care.

Overfeeding should be avoided in artificially-fed infants to prevent obesity.

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6.4 EFFICIENCY OF MILK PRODUCTION

Lactogenesis, characterized as “the beginning of overflowing milk emission around parturition” (Neville and Neifert, 1983), is accepted to be activated by the decline in progesterone following parturition.

Nursing Frequency

When lactation is set up, cross-sectional investigations of very much fed, only breastfeeding ladies nursing 4 to 16 times each day show that there is close to nothing, assuming any, connection between nursing recurrence and newborn child milk. These discoveries don't suggest, be that as it may, that the milk yield of individual moms can't be adjusted by changing nursing recurrence.

Birth Weight

Prentice et al. (1986) and Dewey et al. (1986) watched a relationship between newborn child birth weight and volume of drain consumption. This has all the earmarks of being identified with the more noteworthy sucking quality, recurrence, or sustaining span among bigger newborn children—all of which could build drain volume.

Gestational Age at Delivery

The cooperation of gestational age and birth weight may affect milk in take because preterm newborn children (particularly those conceived at <34 long stretches of incubation) might be excessively frail or young to suck successfully.

Maternal variables

Components affecting the newborn child's interest for milk have not been concentrated completely. At the point when the milk supply is plentiful, the newborn

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child's milk admission is decidedly connected with baby weight. Since the mean load of young men is heavier than that of young ladies of a similar age, admission is additionally connected with the sex of the baby. Ailment of the newborn child may diminish craving and in this way, milk admission.

Maternal factors, for example, age and equality have next to zero relationship to milk creation in many populaces (as estimated by the newborn child's admission of human milk). There have been few investigations of the volume of milk delivered by pre-adult moms.

Maternal tension and stress, which might be exacerbated by poor lactation the board, are accepted to impact drain generation by hindering the drain launch reflex. This reflex typically works well in ladies who are loose and sure of their capacity to breastfeed.

Maternal conduct, for example, cigarette smoking and liquor utilization may impact both milk generation and milk organization.

6.5 DIET IN LACTATION

Pregnancy is a requesting physiological state. In India, it is seen that abstains from food of ladies from the low financial gatherings are basically comparable amid pre-pregnant, pregnant and lactating periods. Subsequently, there is broad maternal lack of healthy nourishment prompting high predominance of low birth weight newborn children and high maternal mortality. Extra nourishment are required to enhance weight gain in pregnancy (10-12 Kg) and birth load of newborn children (around 3 Kg).

As mentioned in earlier units, the day by day diet of a lady ought to contain an extra 350 calories, 0.5 g of protein amid first trimester and 6.9 g amid second trimester and 22.7 g amid third trimester of pregnancy. A few micronutrients are extraordinarily required in additional sums amid these physiological periods. Folic acid, taken all through the pregnancy, decreases the danger of inborn abnormalities and builds the birth weight. The mother and in addition the developing hatchling needs iron to meet the high requests of erythropoiesis (RBC arrangement). Calcium is basic, both amid pregnancy and lactation, for legitimate arrangement of bones and teeth of the posterity, for discharge of bosom drain wealthy in calcium and to avert osteoporosis in the mother. Additionally, iodine consumption guarantees appropriate mental strength of the developing hatchling and baby. Nutrient is required amid lactation to enhance the kid furthermore, Vitamin C should be taken by the lactating mother.

The pregnant/lactating lady ought to eat a wide assortment of foods to ensure that her very own dietary needs and in addition those of her developing baby are met. There is no specific need to change the standard dietary example. Be that as it may, the amount and recurrence of utilization of the diverse foods ought to be expanded. She can infer most extreme measure of energy (about 60%) from rice,

wheat and millets. Cooking oil is a concentrated source of both energy and polyunsaturated unsaturated fats. Great quality protein is sourced from milk, meat, poultry and eggs. Be that as it may, a legitimate mix of oats, heartbeats and nuts likewise gives satisfactory proteins. Mineral, furthermore, nutrient necessities are met by devouring an assortment of occasional vegetables especially green verdant vegetables, drain and crisp natural products. Bioavailability of iron can be enhanced by utilizing aged and grew grams and sustenance wealthy in nutrient C such as citrus natural products. Milk is the best wellspring of organically accessible calcium. Although it is conceivable to meet the necessities for the greater part of the supplements through a fair eating regimen, pregnant/lactating ladies are instructed to take every day supplements with respect to press, folic acid, nutrient B and calcium.

Satisfactory admission of a nutritious eating routine is reflected in ideal weight gain amid pregnancy (10 kg) by the eager lady. She ought to pick foods wealthy in fiber (around 25 g/1000 kcal) like entire grain oats, heartbeats and vegetables, to evade clogging. She should take a lot of liquids including 8-12 glasses of water for each day. Salt admission ought not be confined even to avoid pregnancy-incited hypertension and pre-eclampsia. Abundance admission of drinks containing caffeine like espresso and tea unfavorably influence fetal development and henceforth, ought to be maintained a strategic distance from.

Notwithstanding fulfilling these dietary imperatives, a pregnant lady ought to experience occasional wellbeing registration for weight gain, circulatory strain, and sickliness and get lockjaw toxoid inoculation. She requires enough physical exercise with satisfactory rest for 2-3 hrs. During the day. Pregnant and lactating ladies ought not aimlessly accept any medications without therapeutic exhortation, as some of them could be hurtful to the embryo/child. Smoking and tobacco biting and utilization of liquor ought to be dodged. Wrong sustenance convictions and taboos ought to be disheartened.

The most essential sustenance wellbeing issue is microbial nourishment borne ailment and its anticipation amid pregnancy is one of the vital general wellbeing measure. Staying away from polluted food is essential defensive measure against nourishment borne ailment.

Eat more nourishment amid pregnancy. Eat more entire grains, grew grams and aged sustenance. Take drain/meat/eggs in sufficient sums. Eat a lot of vegetables and organic products. Avoid superstitions and sustenance taboos. Do not utilize liquor and tobacco. Take prescriptions just when endorsed. Take iron, folate and calcium supplements frequently, following 14 four months of pregnancy and proceed with the equivalent amid lactation.

Folic acid is basic for the union of hemoglobin. Folic acid insufficiency prompts macrocytic pallor. Pregnant ladies require a greater amount of folic acid. Folic acid enhancements increment birth weight and diminish inherent inconsistencies. Green verdant vegetables, vegetables, nuts and liver are great wellsprings of folic acid. 500 mg (0.5mg) folic acid supplementation is prompted preconceptionally

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and all through pregnancy for ladies with history of intrinsic peculiarities (neural tube abandons, congenital fissure).

Iron is required for hemoglobin union, mental capacity and to give resistance against sicknesses. Deficiency of iron prompts sickliness. Iron lack is regular especially in ladies of regenerative age and kids. Iron lack amid pregnancy increments maternal mortality and low birth weight babies.

In kids, it builds vulnerability to disease and disables learning capacity. Plant nourishments like green verdant vegetables, vegetables and dry organic products contain press. Iron is additionally acquired through meat, fish and poultry items.

Iron bio-accessibility is poor from plant sustenance however is great from creature nourishments.

Vitamin C - rich organic products like gooseberries (Amla), guava and citrus enhance press retention from plant sustenance.

Beverages like tea tie dietary iron and make it inaccessible. Subsequently, they ought to be stayed away from before amid or not long after a dinner.

Commonly devoured plant based eating regimens give around 18mg of iron as against prescribed admission of 35mg every day. Consequently, supplementation of iron (100 mg essential iron, 0.5 mg folic acid) is suggested for 100 days amid pregnancy from sixteenth week onwards to meet the requests of pregnancy.

Check Your Progress

1. What is colostrum?
2. By what age the infant must be introduced to supplements in addition to the breast milk?
3. What should the day by day diet of a lady through the three trimesters contain?
4. What is ideal weight gain reflecting satisfactory admission of nutrients?

6.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Colostrum, which is the milk secreted at some point of the first 34 days after child birth, is rich in proteins, minerals, vitamins nutrition A and antibodies
2. An infant must be given supplements post the age of 6 months as the production of milk decreases and the child would need the support of supplement for proper growth.
3. The day by day diet of a lady ought to contain an extra 350 calories, 0.5 g of protein amid first trimester and 6.9 g amid second trimester and 22.7 g amid third trimester of pregnancy.

4. Satisfactory admission of a nutritious eating routine is reflected in ideal weight gain amid pregnancy (10 kg) by the eager lady.

6.7 SUMMARY

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- It is crucial that the female is emotionally organized for the duration of being pregnant for breast-feeding and is inspired to eat a well-balanced diet. Anxiety and emotional upset ought to be averted and sufficient rest ought to be ensured.
- It is fundamental to put together the breast, particularly the nipple, for breast-feeding. Mother provoke breast-feeding as early as feasible. Milk manufacturing of the mom is decided via the infant's demand.
- Frequent sucking with the aid of the baby and whole emptying of breast are necessary for sustaining ample breast milk output. A working mom can express her breast milk and shop it hygienically up to 8 hrs. This can be fed to her infant by way of the caretaker.
- Start breast-feeding within an hour after delivery and do not discard colostrum. Breast-feed solely (not even water) for a minimal of six months if the growth of the toddler is adequate. One must continue breast-feeding in addition to nutrient-rich complementary foods (weaning foods), preferably up to 2 years.
- It is well typical that breast milk is the excellent meal for an infant. Fortunately, in India, most rural mothers are capable to breast-feed their youth for extended periods. In fact, this is a boon to Indian children as otherwise the occurrence of under-nutrition amongst them would have been a lot higher.
- At birth, mother's milk by myself is enough for the infant. Requirements of all the nutrients gradually extend with the infant's growth. Simultaneously, the breastmilk secretion in the mom comes down with time.
- Infants cannot eat large quantities of food in one sitting at a given time. So, they should be fed small quantities at frequent intervals (3-4 times a day). Also, the food should be of semi-solid consistency for easy swallowing. When such semi-solid foods are offered initially, the infant tends to spit it out. This should not be mistaken as dislike for that food.
- Breast-milk alone is not enough for infants after 6 months of age. Complementary foods should be given after 6 months of age, in addition to breast-feeding. Do not delay complementary feeding.
- Lactogenesis, characterized as "the beginning of overflowing milk emission around parturition" (Neville and Neifert, 1983), is accepted to be activated by the decline in progesterone following parturition.
- Pregnancy is a requesting physiological state. In India, it is seen that abstains from food of ladies from the low financial gatherings are basically comparable amid pre-pregnant, pregnant and lactating periods. Subsequently, there is

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broad maternal lack of healthy sustenance prompting high predominance of low birth weight newborn children and high maternal mortality. Extra sustenance are required to enhance weight gain in pregnancy (10-12 Kg) and birth load of newborn children (around 3 Kg).

- The day by day diet of a lady ought to contain an extra 350 calories, 0.5 g of protein amid first trimester and 6.9 g amid second trimester and 22.7 g amid third trimester of pregnancy.

6.8 KEY WORDS

- **Pre-eclampsia:** A toxemic condition of late pregnancy characterized by increased blood pressure, swelling of feet and excretion of protein in the urine.
- **Weaning:** It is the gradual replacement of breastfeeding with other foods
- **Amylase rich food (ARF):** Foods rich in amylase- Amylase is an enzyme that converts starch and glycogen into simple sugars

6.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What is lactogenesis?
2. What are the hygienic practices to be adopted for lactating mothers?
3. Short note on Nutrition in lactation.

Long-Answer Questions

1. What is the method to feed a young infant after the age of 6 months?
2. Elaborate diet in lactation for ensuring good health of mother and infant.

6.10 FURTHER READINGS

- Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.
- Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.
- Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.
- Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 7 NUTRITION IN INFANCY

Structure

- 7.0 Introduction
- 7.1 Objectives
- 7.2 Nutritional Allowance for Infants and Breastfeeding
 - 7.2.1 Breastfeeding and Formula Feeding
 - 7.2.2 Nutritional Requirements of Infants
- 7.3 Weaning Foods Suitable for Infants
- 7.4 Feeding the Preterm Infant
- 7.5 Low Birth Weight (LBW) Infants
- 7.6 Under 5 Mortality Rate (MR)
- 7.7 Interventions to Prevent Malnutrition
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- 7.9 Summary
- 7.10 Key Words
- 7.11 Self Assessment Questions and Exercises
- 7.12 Further Readings

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7.0 INTRODUCTION

Nutrition in infancy is guided heavily by breastmilk decisions. Picking whether to breastfeed or formula feed their child is one of the greatest choices hopeful and unexperienced parents will make. Health specialists trust breastmilk is the best wholesome decision for newborn children. Be that as it may, breastfeeding may not be feasible for all ladies. For some, the choice to breastfeed or recipe feed depends on their solace level, way of life, and explicit restorative circumstances.

For mothers who can't breastfeed or who choose not to, baby formula milk is a solid option. Formula feed gives babies the supplements they have to develop and flourish. A few mothers stress that if they don't breastfeed, they won't bond with their infant. In any case cherishing mothers will dependably make an extraordinary bond with their youngsters. Furthermore, encouraging — regardless of how — is an extraordinary time to reinforce that bond.

The choice to breastfeed or recipe feed the child is an individual one. Gauging the upsides and downsides of every strategy can enable you to choose what is best for you and the child. In this unit, you will learn all about the nutrition related aspects of infants.

7.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain nutrition in infancy and nutritional status of the infants
- Discuss rate of growth as the indicator

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- Elaborate nutritional allowances for the infants
- Differentiate between breast feeding and formula feeding
- Discuss food square, weaning foods suitable for infants
- Elaborate on feeding the premature infants
- Explain the low Birth Weight (LBW) infants
- Discuss reasons for under 5 Mortality Rate (MR)
- Elaborate interventions to prevent malnutrition

7.2 NUTRITIONAL ALLOWANCE FOR INFANTS AND BREASTFEEDING

WHO and UNICEF recommend that all infants should be fed exclusively on breast milk for the first six months of their lives. After six months, supplementary foods that are safe and healthy can be introduced, combined with breastfeeding for up to two years or more. While breastfed infants in developing countries receive as much milk as their western counterparts, there is no guarantee that the quality of the milk is adequate. This is because a large percentage of mothers in developing countries suffer from malnutrition, and this affects the quality of milk.

Traditionally, the infant is assumed to be meeting the nutritional needs if he or she is breastfed exclusively and on demand. The composition of breast milk and the volume consumed is of course, also important. It is not difficult to determine the nutrient concentration of breast milk. However, if the infant is getting enough is much more complicated to assess because it depends on many variables, such as the time of the day, the season and emotional state of the mother. There are nutritional variations even within a single feed. As per international standards, only breast milk can fulfil the nutritional needs of an infant and protect against infections. Mother's milk consists of immunoglobulins which build up the baby's developing immunity and directly interact with pathogenic bacteria and minimize the chances of getting diarrhoea. Mother's milk has qualities that keep up with the requirements of the baby and support the development that occurs in the first three to six months of birth.

While formula feeds are created after much research to be as compositionally close to breast milk as possible, they are unable to match the anti-infective qualities of mother's milk. The dietary recommendations regarding volume of Breast milk to be consumed per day is 850 ml for the first six months.

When the baby suckles at the nipple, it is stimulated and, in turn, activates the let-down reflex which encourages milk production. The more vigorous the suckling, the higher is the milk production.

However, if the mother is not in the correct emotional state, the production of milk is affected, in terms of volume and composition of the milk. If a mother is feeling anxious or embarrassed the milk production may be hampered.

7.2.1 Breastfeeding and Formula Feeding

Nursing can be a brilliant affair for both mother and child. It gives perfect nourishment and an uncommon holding background that numerous mothers treasure.

Various wellbeing associations — including the American Academy of Pediatrics (AAP), the American Medical Association (AMA), and the World Health Organization (WHO) — suggest breastfeeding as the best decision for infants. Breastfeeding safeguards against contaminations, forestall sensitivities, and ensure against various endless conditions.

Here are a portion of the numerous advantages of breastfeeding:

Breastfed babies have less diseases and hospitalizations than recipe nourished newborn children. Amid breastfeeding, antibodies and other germ-battling factors go from a mother to her infant and reinforce the invulnerable framework. This helps bring down an infant's odds of getting numerous contaminations, including:

- ear contaminations
- diarrhea
- respiratory contaminations
- meningitis

Breastfeeding additionally may secure children against:

- allergies
- asthma
- diabetes
- obesity
- sudden newborn child demise disorder (SIDS)

Breastfeeding is especially valuable for untimely children. Nourishment and simplicity of assimilation. Frequently called the “immaculate nourishment” for a human infant's stomach related framework, bosom drain's segments — lactose, protein (whey and casein), and fat — are effectively processed by an infant.

As a gathering, breastfed babies have less trouble with absorption than do equation sustained newborn children. Breastmilk will in general be more effectively processed so that breastfed babies have less episodes of looseness of the bowels or blockage.

Breast milk additionally normally contains a considerable lot of the nutrients and minerals that an infant requires. One special case is nutrient D — the AAP suggests that all breastfed babies start accepting nutrient D supplements amid the

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initial 2 months and proceeding until the point when a child expends enough nutrient D-invigorated equation or drain (following 1 year of age).

The U.S. Sustenance and Drug Administration (FDA) directs equation organizations to guarantee they give all the fundamental supplements (counting nutrient D) in their recipes. All things considered, business recipes can't totally coordinate bosom milk's correct synthesis. Why? Since milk is a living substance made by each mother for her individual baby, a procedure that can't be copied in an industrial facility.

Cost-Breast milk doesn't cost a penny, while the expense of recipe rapidly increases. Furthermore, except if you're siphoning breast milk and offering it to the child, there's no requirement for containers, areolas, and different supplies that can be exorbitant. Since breastfed babies are less inclined to fail sick, that may mean they make less excursions to the specialist's office, so less co-pays and less cash are paid for remedies and over-the-counter meds.

Distinctive tastes- Nursing mothers ordinarily require 300 to 500 additional calories for every day, which should originate from a wide assortment of very much adjusted nourishments. This acquaints breastfed babies with various tastes through their moms' breast milk, which has distinctive flavors relying upon what their mothers have eaten. By tasting the nourishment of their "way of life," breastfed babies all the more effortlessly acknowledge strong nourishments.

Accommodation- With no very late races to the store for more milk, breast milk is in every case new and accessible whether you're home or all over the place. What's more, when ladies breastfeed, there's no compelling reason to wash areolas or warm jugs in the middle of the day the night.

More brilliant infants- A few examinations propose that kids who were solely breastfed have somewhat higher IQs than kids who were formula fed.

"Skin-to-skin" contact- Many nursing mothers truly appreciate the experience of holding so intimately with their infants. What's more, the skin-to-skin contact can upgrade the enthusiastic association among mother and baby.

Advantageous for mother, as well. The capacity to absolutely support a child can enable another mother to feel certain about her capacity to think about her infant. Breastfeeding likewise consumes calories and helps recoil the uterus, so nursing mothers might have the capacity to come back to their pre-pregnancy shape and weight speedier. Additionally, researches demonstrate that breastfeeding helps bring down the danger of bosom malignant growth, hypertension, diabetes, and cardiovascular infection, and furthermore may help decline the danger of uterine and ovarian disease.

Breastfeeding Challenges

Breastfeeding can be simple from the get-go for a few moms, however require a significant stretch of time to become acclimated to for other people. Mothers and

children require a lot of tolerance to become accustomed to the everyday practice of breastfeeding.

Basic worries of new mothers, particularly amid the initial couple of many months, may include:

Individual solace- At first, numerous mothers feel uneasy with breastfeeding. In any case, with appropriate training, support, and practice, most mothers conquer this.

If breastfeeding harms all through feedings, or if their areolas and additionally bosoms are sore, it's a smart thought for breastfeeding mothers to get assistance from a lactation specialist or their specialist. Commonly, it's simply an issue of utilizing the best possible system, yet here and there agony can imply that something unique is going on, similar to a contamination.

Time and recurrence of feedings- Breastfeeding requires a committed responsibility from moms, particularly to start with, when babies feed regularly. A breastfeeding plan or the need to siphon breast milk amid the day can make it harder for a few mothers to work, run errands, or travel.

What's more, breastfed babies do need to eat more regularly than infants who take equation, since breast milk processes quicker than recipe. This implies mother may wind up sought after each 2 or 3 hours (perhaps more, perhaps less) in the initial couple of weeks.

Diet- Ladies who are breastfeeding should know about what they eat and drink, since these can be passed to the infant through the bosom drain. Much the same as amid pregnancy, breastfeeding ladies ought not eat angle that are high in mercury and should confine utilization of lower mercury angle.

On the off chance that a mother drinks liquor, a little sum can go to the infant through bosom drain. She should hold up no less than 2 hours after a solitary mixed beverage to breastfeed to abstain from passing any liquor to the infant. Caffeine admission ought to be kept closing to 300 milligrams (around one to some normal espresso) or less every day since it can cause issues like anxiety and fractiousness in a few infants.

Maternal restorative conditions, medications, and bosom surgery

Medical conditions, for example, HIV or AIDS or those that include chemotherapy or treatment with specific drugs can make breastfeeding risky. A lady should check with her specialist or a lactation expert if she's uncertain on the off chance that she ought to breastfeed with an explicit condition. Ladies ought to dependably check with the specialist about the security of taking prescriptions while breastfeeding, including over-the-counter and home-grown medications.

Mothers who've had bosom medical procedure, for example, a decrease, may experience issues with their drain supply if their drain pipes have been separated.

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In this circumstance, a lady ought to converse with her specialist about her worries and work with a lactation authority.

About Formula Feeding

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Financially arranged newborn child recipes are a nutritious choice to breast milk, and even contain a few nutrients and supplements that breastfed babies need to get from enhancements.

Made under sterile conditions, business equations endeavor to copy mother's breast milk utilizing a mind-boggling blend of proteins, sugars, fats, and nutrients that aren't conceivable to make at home. So on the off chance that you don't breastfeed the child, it's essential to utilize just industrially arranged equation and not attempt to make the own.

Other than therapeutic worries that may forestall breastfeeding, for a few ladies, breastfeeding might be excessively troublesome or upsetting. Here are different reasons ladies may decide to equation feed:

Accommodation- Either parent (or another guardian) can nourish the infant a jug whenever (in spite of the fact that this is additionally valid for ladies who siphon their bosom drain). This enables mother to share the bolstering obligations and causes her accomplice to feel increasingly associated with the vital sustaining process and the holding that frequently accompanies it.

Adaptability- When the containers are made, a recipe sustaining mother can abandon her child with an accomplice or guardian and realize that her little one's feedings are dealt with. There's no compelling reason to siphon or to plan work or different commitments and exercises around the infant's encouraging calendar. Furthermore, equation nourishing mothers don't have to locate a private place to nurture out in the open.

Time and recurrence of feedings- Since recipe is less edible than breast milk, equation bolstered babies for the most part need to eat less frequently than breastfed babies.

Diet- Ladies who select to recipe feed don't need to stress over the things they eat or drink that could influence their children.

Feeding Challenges

As with breastfeeding, there are a few difficulties to think about when choosing whether to equation feed.

Absence of antibodies- None of the antibodies found in breast milk are in fabricated equation. So recipe can't give an infant the additional assurance against disease and sickness that breast milk does.

Can't coordinate the multifaceted nature of bosom drain- Produced equations presently can't seem to copy the intricacy of breast milk, which changes as the child's needs change.

Arranging and association- Dissimilar to breast milk which is constantly accessible, boundless, and served at the correct temperature recipe nourishing the infant requires arranging and association to ensure that you have what you require when you require it. Guardians must purchase equation and ensure its dependably available to stay away from late-night hurries to the store.

What's more, it's essential to dependably have the important supplies (like jugs and areolas) clean, effectively available, and prepared to go — else, you will have an exceptionally ravenous, extremely particular infant to reply to. With 8-10 feedings in a 24-hour time span, guardians can rapidly get overpowered on the off chance that they're not arranged and sorted out.

Cost- Recipe can be expensive. Powdered equation is the minimum costly, trailed by concentrated, with prepared to-encourage being the most costly. Also, claim to fame recipes, (for example, soy and hypoallergenic) cost more — at times unquestionably more — than the essential equations.

Plausibility of creating gas and obstruction. Recipe encouraged infants may have a greater number of gas and firmer solid discharges than breastfed babies.

Settling on a Choice

Choosing how you will sustain the infant can be a hard choice. You'll extremely just know the correct decision for the family when the infant comes.

Numerous ladies settle on one technique before the birth and afterward alter their opinions after their child is conceived. Furthermore, numerous ladies choose to breastfeed and supplement with recipe since they find that is the best decision for their family and their way of life.

7.2.2 Nutritional Requirements of Infants

Let's have a look at nutritional requirements for different age groups.

1-3 Month Infant

Amid the child's initial 3 months, breast milk or recipe will give all the nourishment required.

What Changes Should I Expect?

As the newborn child develops, bolstering will change. Infants will begin drinking more milk amid each sustaining, so they won't have to encourage as regularly and will rest longer around evening time.

The infant's hunger will increment amid development spurts. Keep on benefiting from interest and increment the quantity of feedings as required.

The newborn child additionally will turn out to be progressively caution as the weeks pass by, cooing and grinning. So there presumably will be more association among you and the infant amid feedings.

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Coming up next are general rules, and the child might be hungrier pretty much regularly than this. That is the reason it's essential to focus on the infant's signs of being ravenous or full. A child who is getting enough may back off, stop, or get some distance from the bosom or container.

Breastfeeding: how much and how often?

As infants get more established, they will begin to breastfeed less regularly and rest for longer periods during the evening. The newborn child likely is eating enough on the off chance that the person in question seems alarm, substance, and dynamic is consistently putting on weight, developing, and creating feeds six to eight times each day is wetting and dirtying diapers all the time.

The infant probably won't eat enough if the individual in question doesn't seem fulfilled, even in the wake of sustaining, and cries continually or is fractious. Call the infant's specialist in case you're concerned the child isn't motivating enough to eat.

Half a month after birth, breastfed babies will in general have less defecations than they did previously. At around 2 months of age, the child might not have a solid discharge after each bolstering, or even each day. On the off chance that the infant doesn't have a solid discharge following 3 days, call the specialist.

Amid times of quick development, you may see that the little one needs to nourish all the more frequently. This incessant nursing sends a flag to make more drain. Inside a few days, free market activity will get into equalization.

Only breastfed newborn children ought to get nutrient D supplements inside the initial couple of long stretches of life. Different enhancements, water, juice, and strong nourishments aren't generally important.

Check Your Progress

1. What is equation feeding? What factors may affect the decision to choose equation feeding?
2. What are the limitations of liquor and caffeine during breast feeding?

7.3 WEANING FOODS SUITABLE FOR INFANTS

Children process equation more gradually than bosom drain, so in case you're bottle-nourishing, the infant may have less feedings than a breastfed newborn child.

As the child develops, the individual can eat more at each sustaining and may go for longer stretches between feedings. You'll additionally see that the infant is beginning to rest longer during the evening.

Amid the second month, newborn children may take around 4 or 5 ounces at each sustaining. Before 3 months' over, the infant may require an extra ounce at each bolstering.

It's anything but difficult to overload a child when utilizing a container since it less demanding to drink from a jug than from a bosom. Ensure that the gap on the container's areola is the correct size. The fluid should trickle gradually from the gap and not spill out. Additionally, fight the temptation to complete the container when the child hints at being full.

Never prop a jug. Propping a jug may cause stifling and it builds the odds of getting ear diseases and tooth rot.

It's typical for newborn children to "spit up" in the wake of eating or amid burping. Spitting up a little sum — under 1 ounce (30 ml) — shouldn't be a worry as long as it occurs inside a hour of encouraging and doesn't trouble the child.

You can lessen spitting up in these early months by:

- feeding before the infant gets exceptionally eager
- keeping the child in a semi-upstanding position amid the nourishing and for a hour after
- burping the child frequently
- avoiding overloading
- not jarring or playing overwhelmingly with the child directly after a sustaining

If the child is by all accounts spitting up huge sums, is spitting up compellingly, is bad tempered amid or after feedings, or is by all accounts getting thinner or isn't putting on weight not surprisingly, call the specialist. What's more, if the kid has a fever or hints at any lack of hydration, (for example, not wetting diapers), summon the specialist right.

Call the specialist when you have any inquiries or worries about nourishing the newborn child.

4-7 Month Infant

Most children this age is acquainted with strong sustenance. Specialists prescribe slowly beginning strong nourishments when an infant is around a half year old, contingent upon the infant's status and healthful needs.

- Is the child's tongue-pushed reflex gone or reduced? This reflex, which keeps babies from stifling, additionally makes them drive sustenance out of their mouths.
- Can the child bolster his or her own head? To eat strong foods, a newborn child needs great head and neck control and ought to have the capacity to sit up.

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- Is the infant inspired by nourishment? A 6-month-old infant who gazes and gets at the sustenance at dinnertime is unmistakably prepared for some assortment in the nourishment office.

If the specialist gives the thumbs up however the child appears to be baffled or uninterested as you're presenting strong sustenance, have a go at holding up a couple of days or even a long time before attempting once more. Solids are just an enhancement now breast milk and recipe will in any case meet the infant's essential nourishing needs.

Step by step instructions to Start Feeding Solids

At the point when the infant is prepared and the specialist has given you the OK to attempt strong nourishments, pick a period of day when the child isn't worn out or grumpy. You need the infant to be somewhat hungry, however not all that eager that the person in question is vexed. So, you should need to give the infant a chance to breastfeed a while, or give some portion of the standard jug.

Have the watch in the lap or in an upstanding newborn child situate. Newborn children who sit well, ordinarily around a half year, can be put in a high seat with a safety belt.

Most children's first food is a little iron-strengthened baby single-grain oat blended with breast milk or recipe. Place the spoon close to the infant's lips, and let the child smell and taste. Try not to be shocked if this first spoonful is rejected. Hold up a moment and attempt once more. Most sustenance offered to the child at this age will wind up on the infant's jaw, kiddie apron, or high-seat plate.

Try not to add grain to the infant's container except if the specialist teaches you to do as such, as this can make babies end up overweight and doesn't enable the child to figure out how to eat strong sustenance.

When the little one gets the hang of eating oats off a spoon, it might be a great opportunity to present single-fixing puréed vegetables, natural product, or meat. The request in which nourishments are presented doesn't make a difference, however go moderate. Present one nourishment at once and hold up a few days before taking a stab at something unique new. This will give you a chance to recognize any nourishments that the infant might be oversensitive to.

The child may take a short time to "realize" how to eat solids. Amid these months, despite everything you'll be giving the typical feedings of breast milk or recipe, so don't be concerned if the infant rejects certain sustenance at first or doesn't appear to be intrigued. It can simply require some investment.

Food to Avoid

Children are at higher danger of creating food sensitivities on the off chance that at least one close relatives have hypersensitivities or hypersensitivity related conditions, similar to nourishment sensitivities, skin inflammation, or asthma. Converse with the specialist about any family ancestry of food hypersensitivities.

In a few children, their possibility of building up an allergy to peanuts might be identified with when they begin eating shelled nut items. Converse with the specialist about how and when to acquaint these food with the infant.

Conceivable indications of nourishment hypersensitivity or unfavorably susceptible responses include:

- rash
- bloating or an expansion in gassiness
- diarrhea
- vomiting

For progressively extreme unfavorably susceptible responses, like hives or breathing trouble, get therapeutic consideration immediately. On the off chance that the child has any sort of response to a nourishment, don't offer that food again until the point when you chat with the specialist.

Additionally, don't give nectar until after an infant's first birthday celebration. Nectar may contain certain spores that, while safe to grown-ups, can cause botulism in infants. Also, don't give normal dairy animals' milk until the point when the child is more established than a year since it doesn't have the nourishment that newborn children require.

Tips for Introducing Solids

With the boisterous pace of family life, most guardians settle on economically arranged infant food at first. They come in little, advantageous compartments, and producers must meet strict security and sustenance rules. Maintain a strategic distance from brands with included fillers and sugars.

On the off chance that you do plan to set up the own child sustenance at home, pureeing them with a nourishment processor or blender, here are a few things to remember:

- Protect the child from foodborne disease by following the standards for food wellbeing (washing hands well and regularly)
- Try to safeguard the supplements in the child's sustenance by utilizing cooking strategies that hold most nutrients and minerals. Take a stab at steaming or preparing products of the soil as opposed to bubbling, which washes away the supplements
- Freeze parcels that you wouldn't utilize immediately instead of canning them
- Don't serve home-arranged beets, spinach, green beans, squash, or carrots to newborn children more youthful than 4 months old. These can contain abnormal amounts of nitrates, which can cause paleness in children. Use bumped assortments of these vegetables

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Regardless of whether you purchase the child nourishment or influence it the self, to recall that surface and consistency are vital. At first, infants ought to have finely puréed single-fixing sustenance. Only fruit purée, for instance, not apples and pears combined.

After you've effectively attempted individual sustenance, it's ok to offer a puréed blend of two nourishments. At the point when the kid is around 9 months old, coarser, chunkier surfaces will be ok as the person begins moving to an eating routine that incorporates progressively table nourishments.

On the off chance that you utilize monetarily arranged child nourishment in containers, spoon a portion of the food into a bowl to sustain the infant. Try not to bolster the infant specifically from the container since microscopic organisms from the infant's mouth can debase the rest of the nourishment. If you refrigerate opened containers of infant sustenance, it's best to discard anything not eaten inside multi day or two.

Around a half year of age is a decent time to acquaint the infant with a container. Get one with expansive handles and a cover (a "sippy container"), and show the child how to hold and drink from it. You may need to attempt a couple of various mugs to discover one that works for the youngster. Use water at first to maintain a strategic distance from muddled clean-ups.

You can allow the half year old juice, yet serve just 100% organic product juice, not juice drinks or powdered beverage blends. Try not to give fruit juice in a container and make sure to restrict the measure of juice the child beverages to under 4 add up to ounces (120 ml) multi day. An excessive amount of juice includes additional calories without the nourishment of breast milk or equation. Drinking excessively juices can add to unreasonable weight gain and can cause loose bowels.

The objective throughout the following couple of months is to present a wide assortment of food, including iron-braced grains, organic products, vegetables, and puréed meats. On the off chance that the infant doesn't appear to like a specific nourishment, attempt again at later meals. It can take many attempts previously kids warm up to specific nourishments.

8 to 12 Months

By 8 months, most children are experts at dealing with the iron-strengthened oats and the pureed nourishments that are a piece of their eating routine, alongside breast milk or equation.

Throughout the following couple of months, they will begin to investigate table nourishments.

Changing Eating Habits

As you grow the child's sense of taste, keep on giving new nourishments a preliminary run (a couple of days to seven days) to search for any unfavorably susceptible responses. Be that as it may:

- Do not give nectar until after an infant's first birthday celebration. Nectar may contain certain spores that, while safe to grown-ups, can cause botulism in children.
- Do not give customary cow's milk until the point that the infant is more established than a year since it doesn't have the nourishment that babies require.

You can purchase child nourishments that offer new tastes and surfaces. You can fork-crush, cut up, mix or granulate whatever nourishments whatever is left of the family eats. To avoid gagging, cook table nourishments somewhat more, until delicate, and cut them into little pieces that the infant can deal with securely.

When babies are around 9 months old, they often have the finesse and coordination to take nourishment among pointer and thumb so they can take a stab at sustaining themselves with their fingers.

On the off chance that you haven't as of now, have the child join whatever is left of the family at dinners. At this age, they appreciate being at the table.

By the main birthday, babies are prepared to go from recipe to cow's milk. In case you're breastfeeding, you can proceed past the child's first birthday celebration, whenever wanted. On the off chance that you choose to quit breastfeeding before the child's first birthday celebration, you should give press braced recipe. If the child is more than a year, you can offer entire milk.

You've likely previously acquainted the infant with a sippy container, so let him or her continue taking a shot at it. (Juice ought to dependably be given in a glass, not a jug.) After a year, you can serve entire milk in a container, which will help with the change from the jug.

Bolstering Safety

Never leave the child unattended while eating. Try not to serve food that the child could stifle on, for example, entire grapes, crude vegetables, hard natural products, raisins, white bread, bits of hard cheddar, sausage, popcorn, and hard confections.

In case you're uncertain about whether a finger food is sheltered, ask:

- Does it soften in the mouth? Some dry oats will dissolve in the mouth, thus will light and flaky wafers.
- Is it sufficiently cooked so it pounds effortlessly? All around cooked vegetables and natural products will crush effectively. So will canned products of the soil. (Make a point to pick canned nourishments that don't have included sugar or salt.)
- Is it normally delicate? Curds, destroyed cheddar, and little bits of tofu are delicate.
- Can it be gummed? Bits of ready banana and all around cooked pasta can be gummed.

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Making Meals Work

Remember the child’s identity when nourishing the infant. A child who prefers a great deal of incitement may appreciate it when you “play plane” with the spoon to get the nourishment into his or her mouth.

An increasingly delicate tot, be that as it may, may require the attention continued eating with insignificant diversions. If the infant rejects new tastes and surfaces, serve new nourishments in little segments and blend them with sustenance you realize the child likes.

The amount should the baby eat?

Newborn child recipe and breast milk keep on giving vital supplements to developing babies, however children will begin to drink less as they approach the principal birthday. They’re getting more supplements now from the assortment of sustenance they’ve figured out how to eat and appreciate.

You may stress that you’re nourishing the child excessively or insufficient. Focus on the kid’s prompts of appetite and completion. A youngster who is full may suck with less eagerness, stop, or get some distance from the bosom or the jug. With strong nourishments, the child may dismiss, decline to open his or her mouth, or spit the sustenance out.

Give the child a chance to finger feed or hold a spoon while you do the genuine bolstering. This is great planning for the little child years, when kids assume responsibility of bolstering themselves. What’s more, on the off chance that you haven’t effectively, set customary dinner and tidbit times.

Check Your Progress

3. How to stop spitting in babies in the early months?
4. Suggest few ways to ensure safety of child while eating.

7.4 FEEDING THE PRETERM INFANT

As indicated by numerous specialists in neonatal nourishment, the objective for nourishment of the preterm baby ought to be to accomplish a postnatal development rate approximating that of the ordinary hatchling of the equivalent gestational age. Sadly, most preterm babies, particularly those brought into the world exceptionally preterm with to a great degree low birth weight, are not nourished adequate measures of supplements to deliver typical fetal rates of development and, accordingly, wind up development confined amid their healing center period after birth. Development confinement is a huge issue, as various investigations have demonstrated conclusively that under sustenance, particularly of protein, at basic

phases of advancement delivers long haul short stature, organ development disappointment, and both neuronal deficiencies of number and dendritic associations and in addition later conduct and psychological results. Besides, clinical follow-up studies have appeared among newborn children encouraged recipes, the supplement substance of the equation is straightforwardly and decidedly identified with mental and engine results further down the road. Wholesome necessities don't stop during childbirth. In this manner, postponing nourishment after birth 'until the point that the newborn child is steady' disregards the essential point that without sustenance beginning following birth, the baby enters a catabolic condition, and catabolism does not add to ordinary improvement and development. Oxygen is essential for every metabolic procedure. Late patterns to constrain oxygen supply to forestall oxygen poisonous quality have the potential, especially when the blood hemoglobin fixation tumbles to under 8 g/dl, to create development disappointment. Glucose ought to be given at 6– 8 mg/min/kg as not long after birth as could be allowed and balanced by regular estimations of plasma glucose to accomplish and keep up focuses > 45 mg/dl however < 120 mg/dl to dodge the continuous issues of hyperglycemia and hypoglycemia. So also, lipid is required to give in any event 0.5 g/kg/day to avoid fundamental unsaturated fat lack.

Be that as it may, the high rate of sugar and lipid supply that preterm babies frequently get, considering the deficient presumption this is important to advance protein development, will in general deliver expanded fat in organs like the liver and heart and in addition fat tissue. More and better basic unsaturated fat sustenance is significant, however more organ and fat has no known advantage and numerous issues. Amino acids and protein are fundamental for body development as well as for metabolic flagging, protein union, and protein growth. 3.5– 4.0 g/kg/day are important to deliver typical protein equalization and development in extremely preterm babies. Endeavors to advance protein development with insulin has numerous issues – it is ineffectual while adding to much further organ and fat tissue fat affidavit. Enteral bolstering dependably is demonstrated and to date almost all investigations have appeared insignificant enteral encouraging methodologies (e.g., 'trophic feeds') elevate the ability to nourish enterally. Milk has particular points of interest over equations in abstaining from necrotizing enterocolitis (NEC), and keeping in mind that sustaining is related with NEC, insignificant enteral encouraging regimens deliver less NEC than those equipped towards increasingly forceful presentation of enteral nourishing. At long last, overloading has the unmistakable potential to deliver fat tissue, or weight, which at that point prompts insulin obstruction, glucose bigotry, and diabetes. This situation happens all the more regularly as newborn children are bolstered more and put on weight all the more quickly after birth, paying little heed to their introduction to the world weight. Babies with IUGR and postnatal development disappointment might be interestingly 'set up' for this result, while newborn children with in utero stoutness, for example, babies of diabetic moms, as of now are well along this unfavorable result pathway.

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WHO recommendations for measuring growth

Measure weight

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It is recommended to weigh children using a scale with the following features:

- Solidly built and durable
- Electronic (digital reading)
- Measures up to 150 kg
- Measures to a precision of 0.1 kg (100g)

Allows tared weighing “Tared weighing” means that the scale can be re-set to zero (“tared”) with the person just weighed still on it. Thus, a mother can stand on the scale, be weighed, and the scale tared. While remaining on the scale, if she is given her child to hold, the child’s weight alone appears on the scale. Tared weighing has two clear advantages: There is no need to subtract weights to determine the child’s weight alone (reducing the risk of error). The child is likely to remain calm when held in the mother’s arms for weighing.

Explain to the mother the reasons for weighing the child, for example, to see how the child is growing, how the child is recovering from a previous illness, or how the child is responding to changes that have been made in his feeding or care.

If the child is less than 2 years old or is unable to stand, you will do tared weighing. Explain the tared weighing procedure to the mother as follows. Stress that the mother must stay on the scale until her child has been weighed in her arms.

The mother will remove her shoes and step on the scale to be weighed alone first. She may need to adjust any long garments that could cover the display and solar panel of the scale.

After the mother’s weight appears on the display, tell her to remain standing on the scale. Re-set the reading to zero by covering the solar panel of the scale (thus blocking out the light). Then give the mother her child to hold. The child’s weight will appear on the scale. Record the child’s weight.

Measure length

Cover the length board with a thin cloth or soft paper for hygiene and for the baby’s comfort. Explain to the mother that she will need to place the baby on the length board herself and then help to hold the baby’s head in place while you take the measurement. Show her where to stand when placing the baby down, i.e. opposite you, on the side of the length board away from the tape. Also show her where to place the baby’s head (against the fixed headboard) so that she can move quickly and surely without distressing the baby.

Assessment of growth

A BMI table is used for all children up to age 5. To use the BMI table:

Find the child’s length or height (in centimeters) in the far-left column of the table. If the exact measurement is not shown, select the closest one. If the child’s measurement is halfway between those shown, select the next higher measurement.

Look across the row to find the child’s weight. If the exact weight is not shown, select the closest one. If the weight is halfway between those shown, consider it “on the line.”

Trace your finger upward from the weight to find the child’s BMI on the top row of the table. (Or you can trace downward, as the BMIs are also on the bottom row.) If the weight was “on the line,” the BMI will be halfway between those shown, e.g. 15.5 if between 15 and 16.

Record the BMI.

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BMI Chart

WEIGHT lbs	100	105	110	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185	190	195	200	205	210	215
kgs	45.5	47.7	50.0	52.3	54.5	56.8	59.1	61.4	63.6	65.9	68.2	70.5	72.7	75.0	77.3	79.5	81.8	84.1	86.4	88.6	90.9	93.2	95.5	97.7
HEIGHT in/cm	Underweight		Healthy				Overweight				Obese				Extremely obese									
5'0" - 152.4	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
5'1" - 154.9	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36	37	38	39	40
5'2" - 157.4	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	33	33	34	35	36	37	38	39
5'3" - 160.0	17	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	32	32	33	34	35	36	37	38
5'4" - 162.5	17	18	18	19	20	21	22	23	24	24	25	26	27	28	29	30	31	31	32	33	34	35	36	37
5'5" - 165.1	16	17	18	19	20	20	21	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	35	35
5'6" - 167.6	16	17	17	18	19	20	21	21	22	23	24	25	25	26	27	28	29	29	30	31	32	33	34	34
5'7" - 170.1	15	16	17	18	18	19	20	21	22	22	23	24	25	25	26	27	28	29	29	30	31	32	33	33
5'8" - 172.7	15	16	16	17	18	19	19	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	32	32
5'9" - 175.2	14	15	16	17	17	18	19	20	20	21	22	22	23	24	25	25	26	27	28	28	29	30	31	31
5'10" - 177.8	14	15	15	16	17	18	18	19	20	20	21	22	23	23	24	25	25	26	27	28	28	29	30	30
5'11" - 180.3	14	14	15	16	16	17	18	18	19	20	21	21	22	23	23	24	25	25	26	27	28	28	29	30
6'0" - 182.8	13	14	14	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29
6'1" - 185.4	13	13	14	15	15	16	17	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28
6'2" - 187.9	12	13	14	14	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27
6'3" - 190.5	12	13	13	14	15	15	16	16	17	18	18	19	20	20	21	21	22	23	23	24	25	25	26	26
6'4" - 193.0	12	12	13	14	14	15	15	16	17	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26

Fig. 7.1 BMI Chart

7.5 LOW BIRTH WEIGHT (LBW) INFANTS

The birth load of a baby is the primary weight recorded after birth, in a perfect world estimated inside the principal hours after birth, before critical postnatal weight reduction has happened. Low birth weight (LBW) is characterized as a birth load of under 2500 g (up to and including 2499 g), according to the World Health

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Organization (WHO). This meaning of LBW has been in presence for a long time. In 1976, the 29th World Health Assembly concurred on the presently utilized definition. Preceding this, the meaning of LBW was '2500 g or less'. Low birth weight is additionally sorted into low birth weight (VLBW, <1500 g) and to a great degree low birth weight (ELBW, <1000 g). Low birth weight is a consequence of preterm birth (PTB, short incubation <37 finished weeks), intrauterine development confinement (IUGR, otherwise called fetal development limitation), or both.

The term low birth weight alludes to a flat out load of <2500 g paying little mind to gestational age. Little for gestational age (SGA) alludes to babies whose birth weight is not exactly the tenth percentile for gestational age.

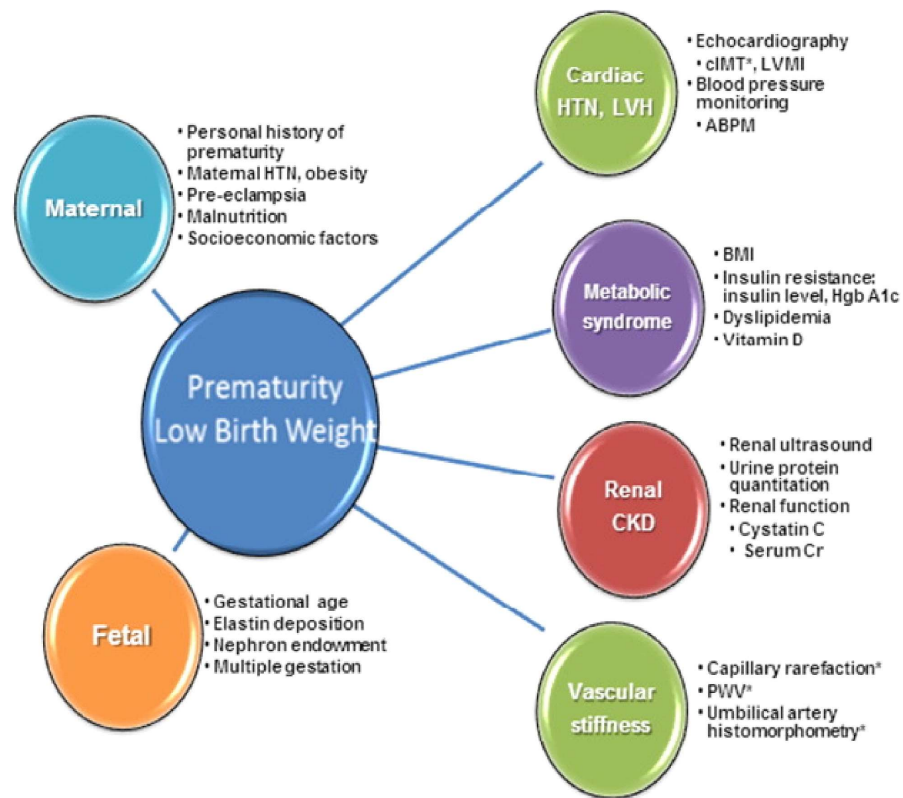


Fig. 7.2 Prematurity Low Birth Weight

7.6 UNDER 5 MORTALITY RATE (MR)

The under-five mortality rate is the probability (expressed as a rate per 1,000 live births) of a child born in a specified year dying before reaching the age of five if subject to current age-specific mortality rates.

The danger of a kid passing on before finishing five years old is yet most astounding in the WHO African Region (74 for each 1000 live births), around multiple times higher than that in the WHO European Region (9 for every 1000 live births). Numerous nations still have high under-five mortality – especially those in WHO African Region, home to 5 of the 6 nations with an under-five death rate over 100 passing for every 1000 live births. What’s more, disparities in kid mortality between high-salary and low-pay nations stay substantial. In 2017, the under-five death rate in low-salary nations was 69 passing for every 1000 live births – around multiple times the normal rate in high-pay nations (5 passing for each 1000 live births). Diminishing these imbalances crosswise over nations and sparing more youngsters’ lives by completion preventable child mortality are imperative needs. India’s infant mortality rate in 2017 was 32 deaths per 1,000 live births, compared to the global average of 12. The under 5 mortality rate (U5MR) in 2011 was 53.

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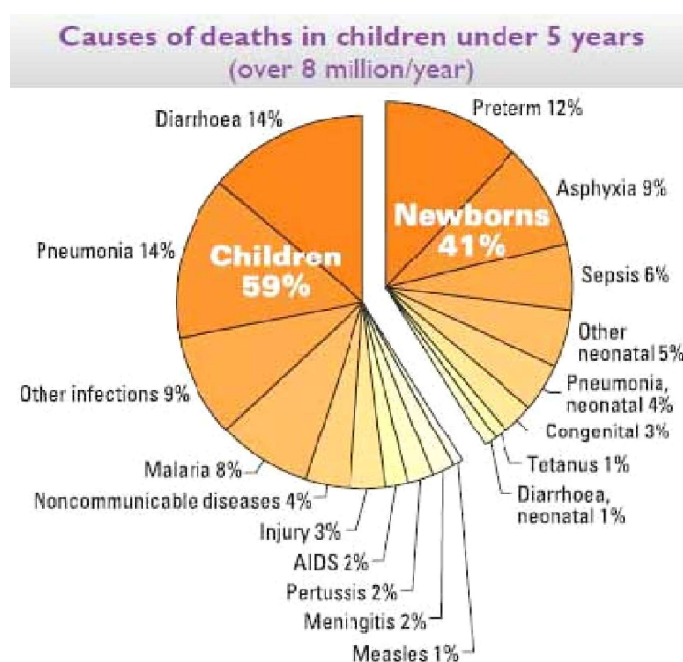


Fig. 7.3 Causes of Death of Children Under 5 years of Age

7.7 INTERVENTIONS TO PREVENT MALNUTRITION

There are two noteworthy methodologies in tending to malnutrition.

1. Nourishing arranging
2. Coordinate food and wellbeing advancement

We will learn more about these measures in the next unit.

National Nutrition Mission

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The National Nutrition Mission (NNM) has been set up with a three year budget of Rs.9046.17 crore commencing from 2017-18. The NNM is a comprehensive approach towards raising nutrition level in the country on a war footing. It will comprise mapping of various Schemes contributing towards addressing malnutrition, including a very robust convergence mechanism, ICT based Real Time Monitoring system, incentivizing States/UTs for meeting the targets, incentivizing Anganwadi Workers (AWWs) for using IT based tools, eliminating registers used by AWWs, introducing measurement of height of children at the Anganwadi Centres (AWCs), Social Audits, setting-up Nutrition Resource Centres, involving masses through *Jan Andolan* for their participation on nutrition through various activities, among others.

NNM targets to reduce stunting, under-nutrition, anemia (*among young children, women and adolescent girls*) and reduce low birth weight by 2%, 2%, 3% and 2% per annum respectively. Although the target to reduce Stunting is at least 2% p.a., Mission would strive to achieve reduction in Stunting from 38.4% (NFHS-4) to 25% by 2022 (*Mission 25 by 2022*). More than 10 crore people will be benefitted by this programme. All the States and districts will be covered in a phased manner i.e. 315 districts in 2017-18, 235 districts in 2018-19 and remaining districts in 2019-20.

The mission has enumerated the following key Nutrition strategies and interventions:

1. IYCF (Infant and Young child feeding)
2. Food and Nutrition
3. Immunization
4. Institutional Delivery
5. WASH (Water, Sanitation and Hygiene)
6. De-worming
7. ORS-Zinc
8. Food Fortification
9. Dietary Diversification
10. Adolescent Nutrition
11. Maternal Health and Nutrition
12. ECD (Early childhood development)/ECCE (Early Childhood care and Education)
13. Convergence
14. ICT-RTM (Information and Communication. Technology enabled Real Time Monitoring)
15. Capacity Building

Under the National Nutrition Strategy

The Interventions for Infant and Young Child Care and Nutrition will focus on children under 3 years, through the promotion of –

- Universal early initiation (within 1 hour of birth) and exclusive breastfeeding for the first six months of life.
- Universal timely and appropriate complementary feeding after six months, along with continued breastfeeding for two years or beyond.
- Universal growth monitoring and promotion of young children-using WHO CGS with counseling of mothers/families using the Mother Child Protection Card.
- Universal access to infant and young child care (including ICDS, crèches, linkages with MGNREGA), with improved supplementary nutritional support/ THR through ICDS.
- Enhanced care, improved feeding during and after illness, nutritional support, referrals and management of severely and acutely undernourished and/or sick children.

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Check Your Progress

5. Why are amino acids important?
6. What is low birth weight a consequence of?

7.8 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Equation feeding is a method to feed the baby with formulated milk rather than the breast milk. The choice of breast feeding and equation feeding depends on their solace level, way of life, and explicit restorative circumstances.
2. If a mother drinks liquor, a little sum can go to the infant through breast milk. She should hold up no less than 2 hours after a solitary mixed beverage to breastfeed to abstain from passing any liquor to the infant. Caffeine admission ought to be kept closing to 300 milligrams (around one to some normal espresso) or less every day since it can cause issues like anxiety and fractiousness in a few infants.
3. You can lessen spitting up in these early months by:
 - o feeding before the infant gets exceptionally eager
 - o keeping the child in a semi-upstanding position amid the nourishing and for a hour after

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- o burping the child frequently
 - o avoiding overloading
 - o not jarring or playing overwhelmingly with the child directly after a sustaining
4. Few ways to ensure safety of child while eating are: never leave the child unattended while eating. Try not to serve sustenance that the child could stifle on, for example, entire grapes, crude vegetables, hard natural products, raisins, white bread, bits of hard cheddar, sausage, popcorn, and hard confections.
 5. Amino acids and protein are fundamental for body development as well as for metabolic flagging, protein union, and protein growth.
 6. Low birth weight is a consequence of preterm birth (PTB, short incubation <37 finished weeks), intrauterine development confinement (IUGR, otherwise called fetal development limitation), or both.

7.9 SUMMARY

- WHO and UNICEF recommend that all infants should be fed exclusively on Breast milk for the first six months of their lives. After six months, supplementary foods that are safe and healthy can be introduced, combined with breastfeeding for up to two years or more. While breastfed infants in developing countries receive as much milk as their western counterparts, there is no guarantee that the quality of the milk is adequate. This is because a large percentage of mothers in developing countries suffer from malnutrition, and this affects the quality of milk.
- While formula feeds are created after much research to be as compositionally close to breast milk as possible, they are unable to match the anti-infective qualities of mother's milk. The dietary recommendations regarding volume of breast milk to be consumed per day is 850 ml for the first six months.
- Breastfed babies have less diseases and hospitalizations than recipe nourished newborn children. Amid breastfeeding, antibodies and other germ-battling factors go from a mother to her infant and reinforce the invulnerable framework. This helps bring down an infant's odds of getting numerous contaminations.
- Breastfeeding is especially valuable for untimely children. Nourishment and simplicity of assimilation. Frequently called the "immaculate nourishment" for a human infant's stomach related framework, bosom milk's segments — lactose, protein (whey and casein), and fat — are effectively processed by an infant.

- Breastfeeding can be simple from the get-go for a few moms, however require a significant stretch of time to become acclimated to for other people. Mothers and children require a lot of tolerance to become accustomed to the everyday practice of breastfeeding.
- Numerous ladies settle on one technique before the birth and afterward alter their opinions after their child is conceived. Furthermore, numerous ladies choose to breastfeed and supplement with recipe since they find that is the best decision for their family and their way of life.
- As infants get more established, they will begin to breastfeed less regularly and rest for longer periods during the evening. The newborn child likely is eating enough on the off chance that the person in question seems alarm, substance, and dynamic is consistently putting on weight, developing, and creating feeds six to eight times each day is wetting and dirtying diapers all the time.
- Children process formula milk more gradually than breast milk, so in case you're bottle-nourishing, the infant may have less feedings than a breastfed newborn child.
- As the child develops, the individual can eat more at each sustaining and may go for longer stretches between feedings. You'll additionally see that the infant is beginning to rest longer during the evening.
- Children are at higher danger of creating sustenance sensitivities on the off chance that at least one close relatives have hypersensitivities or hypersensitivity related conditions, similar to nourishment sensitivities, skin inflammation, or asthma. Converse with the specialist about any family ancestry of food allergies.
- As indicated by numerous specialists in neonatal nourishment, the objective for sustenance of the preterm baby ought to be to accomplish a postnatal development rate approximating that of the ordinary hatchling of the equivalent gestational age. Sadly, most preterm babies, particularly those brought into the world exceptionally preterm with to a great degree low birth weight, are not nourished adequate measures of supplements to deliver typical fetal rates of development and, accordingly, wind up development confined amid their healing center period after birth.
- It is recommended to weigh children using a scale with the following features:
 - o Solidly built and durable
 - o Electronic (digital reading)
 - o Measures up to 150 kg
 - o Measures to a precision of 0.1 kg (100g)

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- The birth load of a baby is the primary weight recorded after birth, in a perfect world estimated inside the principal hours after birth, before critical postnatal weight reduction has happened. Low birth weight (LBW) is characterized as a birth load of under 2500 g (up to and including 2499 g), according to the World Health Organization (WHO).
- There are two noteworthy methodologies in tending to malnutrition.
 - o Nourishing arranging
 - o Coordinate sustenance and wellbeing advancement

7.10 KEY WORDS

- **Under-five mortality rate:** Probability of dying between birth and exactly 5 years of age, expressed per 1,000 live births.
- **Infant mortality rate:** Probability of dying between birth and exactly 1 year of age, expressed per 1,000 live births.
- **Neonatal mortality rate:** Probability of dying during the first 28 days of life, expressed per 1,000 live births.
- **Probability of dying among children aged 5–14:** Probability of dying at age 5–14 years expressed per 1,000 children aged 5.

7.11 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the benefits of breastfeeding for children?
2. What is WHO recommended method of measuring weight?
3. What is under 5 mortality rate?
4. Write a short note on interventions to prevent malnutrition.

Long-Answer Questions

1. Elaborate on the reasons to choose formula or equation feeding.
2. What is low birth weight measures? What are the primary reasons for Low Birth Weight?

7.12 FURTHER READINGS

- Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.
- Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.
- Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.
- Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

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UNIT 8 NUTRITION IN PRESCHOOL AGE

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Structure

- 8.0 Introduction
- 8.1 Objectives
- 8.2 Healthy Meal Choices
- 8.3 Growth During the Preschool Years
 - 8.3.1 Physical Activity for Preschoolers
- 8.4 Food Safety for Preschoolers
- 8.5 Interventions to Address Malnutrition Among Preschoolers
- 8.6 Answers to Check Your Progress Questions
- 8.7 Summary
- 8.8 Key Words
- 8.9 Self Assessment Questions and Exercises
- 8.10 Further Readings

8.0 INTRODUCTION

Preschool-age children in the ages between three to five are at a stage of growing their consuming habits and they require encouragement to eat healthy ingredients and snacks. These kids are eager to learn. They will regularly imitate ingesting behaviors of adults. They need supervision at mealtime as they are in the process of working on chewing and swallowing skills. In this unit, you will learn all the aspects related to nutrition in preschool age.

8.1 OBJECTIVES

After going through this unit, you will be able to:

- Describe healthy meal choices for preschool children
- Discuss growth and development of preschool children
- Explain food habits and nutrient intake of preschool children
- Discuss dietary allowances – supplementary foods, reasons for under 5 Mortality Rate
- Explain interventions to prevent malnutrition among preschoolers

8.2 HEALTHY MEAL CHOICES

Preparing healthy meals for preschoolers requires careful consideration. These are some useful mealtime pointers for preschool-age children:

- Make regular meals, provide usually scheduled snacks, and restrict unplanned eating. Children will be hungry at mealtime if snacks have been limited throughout the day.
- Discourage negative behaviours at mealtime. Focus on eating, not toying with food at the dinner table.
- Running while eating or taking partly chewed food in while eating can cause an infant to choke. Have the toddler sit still when eating.
- Keep supplying a variety of foods. Have the attitude that sooner or later, the toddler will research to eat nearly all foods.
- Make mealtime as nice as possible. Don't put strain on the child to eat. Do not force the infant to 'clean' his or her plate. This can also lead to overeating, which can cause the infant to obtain too an awful lot weight.
- Provide examples of wholesome consuming habits. Preschoolers imitate what they see their dad and mom doing. If the parents have unhealthy ingesting habits, the toddler will not learn to eat healthy.

It is important that the infant eats a range of foods and this is why parents must encourage the proper intake quantity of energy and fat. The following guide might be useful for this purpose.

- Grains: Foods that are made from wheat, rice, oats, cornmeal, barley, or some other cereal grain are grain products. Examples include whole-wheat, brown rice, and oatmeal. Aim for broadly speaking whole-grains.
- Vegetables: Vary the vegetables. Choose a variety of colourful vegetables. These can include darkish green, red, and orange vegetables, legumes (peas and beans), and starchy vegetables.
- Fruits: Any fruit or 100 per cent fruit juice counts as part of the fruit group. Fruits might also be fresh, canned, frozen, or dried, and may additionally be whole, cut up, or pureed.
- Dairy: Milk products and many foods made from milk are regarded phase of this food group. Focus on fat-free or low-fat products, as well as these that are high in calcium.
- Protein: Go lean on protein. Choose low-fat or lean meats and poultry. Vary the protein routine. Choose extra fish, nuts, seeds, peas, and beans.
- Oils: These are now not a meals group, yet some, like nut oils, have imperative nutrients and can be protected in the diet. Animal fats, which are solid fats, have to be avoided.

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Merely food intake is not enough to help preschoolers maintain a healthy body. This is why parents must encourage exercise and everyday physical pastime with a wholesome dietary plan.

Nutrition and Exercise Tips

Here are some hints to follow:

- Try to control when and where the meals are eaten by deciding on specific normal every day meal times. Include social interplay and reveal healthful consuming behaviours.
- Involve teens in the deciding on and getting ready of foods. Teach them to make wholesome preferences via helping them to choose ingredients nutritious based.
- Select foods with these nutrients when possible: calcium, magnesium, potassium, and fiber.
- Parents must be careful to decide the appropriate serving sizes for children.
- Parents must restrict children's technology display time to less than 2 hours daily. Instead, encourage activities that call for extra movement.
- To forestall dehydration, encourage kids to drink fluid regularly.

8.3 GROWTH DURING THE PRESCHOOL YEARS

The preschool years are an essential time for developing healthy habits for life. From the age of two to five, children's bodies develop and strengthen in methods that affect the way they think, eat, and behave. The following behavioural milestone is helpful to study what ingesting behaviours must be expected at each age. The timing of these milestones may vary with every child.

Between the age of two and five years, the common infant grows about 2½ inches, and gains four to five kilos each year, however each infant is different. The parents and the preschooler's medical doctor are partners in preserving the kid's health, so discuss some of the points for child's growth.

Growth Charts

Growth charts are a desirable way to screen the child's increase and health. Visit the child's medical doctor regularly. As part of the visit, the health practitioner will weigh and measure the infant and plot their data on a growth chart.

Over time, the curve of the increase chart will show the child's boom pattern and whether their top and weight are changing at the proper rate.

Table 8.1 Nutritional Level Requirements as per Daily Activity for Children Aged 2-5

Age	Sex	Daily Activity	Nutrition Level
2 years	Boys and Girls	Any Level	1000 calories
3 years	Boys	30 mins	1200 calories
		30-60 mins	1400 calories
		60 mins	1400 calories
	Girls	30 mins	1000 calories
		30-60 mins	1200 calories
		60 mins	1400 calories
4-5 years	Boys	30 mins	1200 calories
		30-60 mins	1400 calories
		60 mins	1600 calories
	Girls	30 mins	1200 calories
		30-60 mins	1400 calories
		60 mins	1400 calories

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Fruits: Focus on entire fruits

The following pointers may help the parents encourage the pre-schoolers to take their fruits:

- Serve a rainbow of choices. Fruit can be a quick and easy way to make meals and snacks more healthy and greater colorful.
- Choose from fresh, frozen, canned, and dried fruits. Purchase canned fruit in water or a hundred percent fruit juice instead of syrup.
- Limit fruit juice. While 100 per cent fruit juice can be part of a healthful diet, it does not include the dietary fiber discovered in other forms of fruit.
- Offer raisins or different unsweetened dried fruit as a substitute of chewy fruit snacks or strips, which generally comprise very little fruit.

Vegetables

The following pointers may help the parents encourage the pre-schoolers to take their vegetables:

- Serve a range of colorful choices. Brighten children’s plates with red, orange, and dark-green vegetables.
- Choose from fresh, frozen, or canned vegetables. Prepare and serve greens barring delivered salt or strong fat.
- Try a dip. Kids love to dip their foods. Whip up a rapid dip for veggies with yogurt and seasonings such as herbs or garlic. Serve with uncooked veggies like broccoli, carrots, or cauliflower.

Grains

The following pointers may help the parents encourage the pre-schoolers to take their grains:

- Make at least half of their grains complete grains by using imparting a hundred percent whole-grain cereals, breads, and pasta.

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- Vary the alternatives for total grains. Rolled oats, oatmeal, brown rice, wild rice, buckwheat, quinoa, wheat berries, and millet are whole-grain foods.
- Choose toppings accurately for toast, warm cereals, pasta, and rice. Instead of including butter, stick margarine, and ordinary full-fat cheese, use vegetable oils, low-fat cheeses, or marinara sauce as toppings.

Protein Foods

The following pointers may help the parents encourage the pre-schoolers to take their proteins:

- Choose a variety of protein foods such as seafood, beans, lean meats, poultry, and eggs.
- Limit processed poultry, fish, or meat (like hotdogs, chicken nuggets, and fish sticks). And even some “reduced-fat” meats and bloodless cuts, like sausage, bologna, and salami, which can also be excessive in saturated fat and sodium.
- Add beans to children’s favoured foods. Add beans and peas to tacos, casseroles, stews, pastas, and facet dishes.

Dairy

The following pointers may help the parents encourage the pre-schoolers to take their dairy:

- Serve unflavoured, fat-free, and low-fat milks most often. They have less delivered sugar and fewer energy than flavored, whole, or reduced-fat milk.
- Low-fat milk, yogurt, and cheese supply a great deal wanted calcium. Try making a dip for fruits or greens from yogurt.
- Blend dairy into smoothies. Combine low-fat or fat-free yogurt with bananas and cocoa powder for a smoothie, or strive milk, ice cubes, and frozen berries.

The meals and drinks the preschooler has, in the course of the day, are essential for his or her health. Fruits, vegetables, grains, protein foods, and dairy are a section of a healthy eating fashion and together provide the vitamins their bodies need. Limit the quantity of brought sugars, sodium, and saturated fats in the preschooler’s meals, drinks, and snacks.

Tips for Picky Eaters

Picky ingesting is typical for many preschoolers. It’s definitely any other step in the technique of developing up and becoming independent. As long as the preschooler is healthy, growing normally, and has masses of energy, he or she is most in all likelihood getting the vitamins he or she needs.

Typical picky consuming behaviours include

- Many youngsters will exhibit one or greater of the following behaviours at some stage in the preschool years. In most cases, these will go away with time.
- The infant might also refuse a food based totally on a certain color or texture. For example, he or she may want to refuse foods that are purple or green, include seeds, or are squishy.
- For a period of time, the preschooler may solely devour a certain kind of food. The baby may also choose one or two ingredients he or she likes and refuse to eat something else.
- Sometimes the infant may additionally waste time at the desk and appear involved in doing something else instead of eating.
- The toddler may additionally be unwilling to try new foods. It is ordinary for the preschooler to prefer familiar ingredients and be afraid to try new things.

The child's choosy eating is temporary. If the parents understand this and do not make it a massive deal, it will generally pass before school age. The parents may try the following suggestions to deal with the child's picky eating conduct in a fantastic way:

- Have the toddler help you put together meals. Children analyse food and get excited about tasting food when they help make meals. Let them add ingredients, scrub veggies, or help stir.
- Offer choices. Rather than asking, 'Do you prefer broccoli for dinner?' ask 'Which would you like for dinner, broccoli or cauliflower?'
- Enjoy each other while eating household ingredients together. Talk about enjoyable and blissful things. If ingredients are instances for family arguments, the toddler may additionally form unhealthy attitudes toward food.
- Offer the identical foods for the total family. Serve the equal meal to adults and kids. Let them see you enjoy healthy foods. Talk about the colours, shapes, and textures on the plate.

Trying New foods

The child may also not prefer to try new foods. It is normal for preschoolers to reject meals they have by no means tried before. Here are some recommendations to get the infant to strive new foods:

- Small portions, massive benefits. Let the kids try small parts of new meals that you enjoy. Give them a small style at first and be patient with them. When they strengthen a taste for more types of foods, it's less complicated to diagram family meals.

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- Offer only one new meal at a time. Serve something that you might be aware the infant likes alongside with the new food. Offering extra new foods all at as soon as ought to be too a lot for the child.
- Be a top position model. Try new meals yourself. Describe their taste, texture, and smell to the child.
- Offer new ingredients first. The infant is most hungry at the begin of a meal.
- Sometimes, new meals take time. Kids don't always take to new ingredients proper away. Offer new ingredients many times. It might also take up to a dozen tries for an infant to be given a new food.

8.3.1 Physical Activity for Preschoolers

Being bodily lively helps the preschooler analyse healthy habits. Preschoolers who take part in active play can get the physical endeavour they want to maintain a healthful weight, enhance muscle tissues and robust bones, and minimize their threat of developing chronic diseases such as Type 2 diabetes.

Follow these suggestions to assist the preschooler be active:

- Encourage the preschooler to play actively quite a few instances each and every day. Preschoolers' pastime might also happen in short bursts of time as a substitute of all at once.
- Limit TV, tablet, and other screen time to much less than 1 hour whole per day, as mentioned earlier.
- Preschoolers want quiet time however make positive the preschooler is no longer inactive for too long. Read a book together or create a craft as a substitute than unwinding with display screen time.
- Be a role model and restrict your own inactivity. The preschooler will examine that being physically active is part of a wholesome life. Manage the time you spend watching TV or the use of cell devices.
- Look for active childcare settings that have interaction with other preschoolers.
- Make activities or playtime enjoyable for the whole family. Let the infant help lead the fun! Take a stroll collectively after dinner, play catch, kick a ball, or turn up the track and dance.

Check Your Progress

1. Give examples of grain products.
2. What is the average a child grows between the age of two and five years?

8.4 FOOD SAFETY FOR PRESCHOOLERS

Preschoolers' immune system is developing at their age. Following common food security tips to avoid foodborne illness is important. Follow these extra food security recommendations to preserve the preschooler healthy and safe.

Hand washing is one of the most important methods to prevent the preschooler from getting sick. Children must wash their palms with warm water and cleaning soap for 20 seconds at the following times:

- After the use of the bathroom
- Before and after dealing with meals or eating
- After playing with pets or touring a petting zoo
- After coughing or sneezing
- When their palms are dirty

Prevent Choking

Prevent choking with the help of encouraging the habit of taking small or tough portions of food. The preschooler may easily choke on some foods. Avoid ingredients that are smaller than one-half inch (1/2 in.) or about the size of a nickel such as:

- Peanuts
- Chewing gum
- Round slices of warm canine or sausage
- Whole grapes
- Cherry tomatoes
- Tough meats

To stop choking, have the preschooler take a seat down when they eat. Avoid letting them run, walk, play, or lie down with food in their mouth.

Avoid Raw Foods

Some foods are more likely to purpose foodborne illness. Avoid serving the preschooler the following foods:

- Unpasteurized (raw) milk or any products made from unpasteurized milk
- Raw or partially cooked eggs or meals containing uncooked eggs
- Raw or undercooked meat, poultry, fish, and shellfish. Cook meals to safe minimal inner temperatures
- Unpasteurized juices
- Unwashed fruits or vegetables, specifically raw sprouts

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Seafood Safety

Some seafood contain unhealthy chemicals, like mercury. Choose fish which do not have such harsh chemical or pollutants to make sure what the child eats is safe.

Choices that are decrease in mercury include:

- Salmon
- Flounder
- Tilapia
- Trout
- Pollocks
- Catfish

8.5 INTERVENTIONS TO ADDRESS MALNUTRITION AMONG PRESCHOOLERS

There are two major approaches in addressing malnutrition

- Nutritional planning
- Direct nutrition and health development

Nutritional planning

This involves a serious commitment. The government assumes a leadership role in nutritional planning.

Nutritional planning involves formulation of a nutrition policy and overall long-term planning to improve production and supplies of food, ensure its equitable distribution and programs to increase the purchasing power of people. This may include, land reforms, proper guidance in agriculture to help farmers to get better yields from their lands, help in proper marketing of farm produce. To help increasing the capacity of people to buy nutritious food in adequate quantity, income generating activities for the weaker sections of the community, making available good quality food in affordable prices through proper public distribution system, etc are some of the plans for the government to implement.

Direct nutrition and health interventions

This includes: Improved health care system

Infections like malaria, measles and diarrhoea are prevalent in our society and they precipitate acute malnutrition among children and infants. A good health care system that provides immunization, oral rehydration, periodic deworming, early diagnosis and proper treatment of common illnesses can go a long way in preventing malnutrition in the society.

Nutrition education

People can be educated about

- i. The nutritional quality of common foods
- ii. Importance and nutritional quality of various locally available and culturally accepted low cost foods
- iii. Importance of exclusive breastfeeding for six months and continuing to breast feed up to two years or beyond.
- iv. Damage caused by irrational beliefs and cultural practices of feeding
- v. Recipes for preparing proper weaning foods and good supplementary food from locally available low cost foods.
- vi. Importance of including milk, eggs, meat or pulses in sufficient quantities in the diet to enhance the net dietary protein value.
- vii. Importance of feeding children and adults during illness
- viii. Importance and advantages of growing a kitchen garden
- ix. Importance of immunizing their children and following proper sanitation in their day to day life.

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Early detection of malnutrition and intervention

- i. The longer the developmental delays remain uncorrected, the greater the chance of permanent effects and hence intervention must occur during pregnancy and first three years of life.
- ii. A well recorded growth chart can detect malnutrition very early. Velocity of growth is more important than the actual weight at a given time
- iii. If growth of the child is slowed or is arrested as shown by flat curve on the growth card, physician should be alerted and any hidden infection or any reason for nutritional deficiency must be evaluated and taken care of.
- iv. If growth chart is not maintained, anthropometric indices like, weight, height mid arm circumference, and chest circumference etc. can be measured and used for evaluation of nutrition.

Nutrition supplementation

Usually, biologically vulnerable groups like pregnant women, infants, preschool going and school going children are targeted by various welfare measures conducted by the government. Calories, proteins and micronutrients like iron, vitamin A and zinc can be supplemented.

i. Objective of nutrition supplementation of infants and children includes

- (a) To treat and rehabilitate severely malnourished subjects

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- (b) Improve the general health and wellbeing of children, increase the resistance to infectious illnesses and thereby decrease morbidity
- (c) Accelerate the physical growth and mental development of children
- (d) Improve the academic performance and learning abilities of children.

ii. Objective of supplementing pregnant and lactating women include

- (a) Preventing anaemia in the mother thus improving her health and the pregnancy outcome.
- (b) Improving calorie intake and prevent low birth weight baby, thus breaking the vicious cycle of intergenerational cycle of growth failure.
- (c) Supplementing calcium to prevent osteoporosis

Check Your Progress

3. Which size of foods may result in choking?
4. Which type of health care system can go a long way in preventing malnutrition?

8.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Foods that are made from wheat, rice, oats, cornmeal, barley, or some other cereal grain are grain products. Examples encompass whole-wheat, brown rice, and oatmeal.
2. Between the age of two and five years, the common infant grows about 2½ inches, and gains four to five kilos each year, however each infant is different.
3. Food ingredients that are smaller than one-half inch (1/2 in.) or about the size of a nickel may result in choking.
4. A good health care system that provides immunization, oral rehydration, periodic deworming, early diagnosis and proper treatment of common illnesses can go a long way in preventing malnutrition in the society.

8.7 SUMMARY

- Preparing healthy meals for preschoolers requires careful consideration. These are some useful mealtime pointers for preschool-age children: Make regular meals, discourage negative behaviours at mealtime, have the toddler sit still when eating, keep supplying a variety of foods, make mealtime as nice as possible, and provide examples of wholesome consuming habits.

- The health meal plan must include: Grains, vegetables, fruits, dairy, protein and oils.
- The preschool years are an essential time for developing healthy habits for life. From the age of two to five, children's bodies develop and strengthen in methods that affect the way they think, eat, and behave.
- Between the age of two and five years, the common infant grows about 2½ inches, and gains four to five kilos each year, however each infant is different. The parents and the preschooler's medical doctor are partners in preserving the kid's health, so discuss some of the points for child's growth.
- Picky ingesting is typical for many preschoolers. It's definitely any other step in the technique of developing up and becoming independent. As long as the preschooler is healthy, growing normally, and has masses of energy, he or she is most in all likelihood getting the vitamins he or she needs.
- The child's choosy eating is temporary. If the parents understand this and do not make it a massive deal, it will generally pass before school age.
- The child may also not prefer to try new foods. It is normal for preschoolers to reject meals they have by no means tried before.
- Being bodily lively helps the preschooler analyse healthy habits. Preschoolers who take part in active play can get the physical endeavour they want to maintain a healthful weight, enhance muscle tissues and robust bones, and minimize their threat of developing chronic diseases such as Type 2 diabetes.
- Preschoolers' immune system is developing at their age. Follow important common food security tips to avoid foodborne illness. Extra food security recommendations to ensure that the preschooler is healthy and safe.
- There are two major approaches in addressing malnutrition: Nutritional planning and Direct nutrition and health development

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8.8 KEY WORDS

- **Preschool-age children:** This refers to the age group of children in the ages between three to five
- **Picky Eaters:** It is a feeding difficulty wherein the person is very selective about what they eat
- **Type 2 diabetes:** It is a chronic condition that affects the way the body processes blood sugar (glucose).
- **Nutritional planning:** It involves formulation of a nutrition policy and overall long-term planning to improve production and supplies of food, ensure its equitable distribution and programs to increase the purchasing power of people

8.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short-Answer Questions

1. Give some useful mealtime pointers for preschool-age children.
2. List some nutrition and exercise tips for preschoolers.
3. What are some of the suggestions to assist the preschooler to be active?
4. Write a short note on nutritional planning.
5. What is nutrition supplementation?

Long-Answer Questions

1. Discuss the components of meals for growth during preschool years.
2. Describe food safety for pre-schoolers.
3. Explain the problems and tips for dealing with picky eaters.
4. Discuss the concept of direction nutrition and health interventions.

8.10 FURTHER READINGS

- Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.
- Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.
- Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.
- Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

BLOCK - III
NUTRITION IN SCHOOL AGE, ADOLESCENCE
AND ADULTS

*Nutrition During
School Age*

NOTES

UNIT 9 NUTRITION DURING
SCHOOL AGE

Structure

- 9.0 Introduction
- 9.1 Objectives
- 9.2 Physical Development of School Going Children
 - 9.2.1 Nutritional Status and Nutritional Requirements of School Going Children
 - 9.2.2 Food Habits in School Going Children
 - 9.2.3 Interventions to Prevent Malnutrition in School Going Children
 - 9.2.4 Nutrition and Performance
- 9.3 Answers to Check Your Progress Questions
- 9.4 Summary
- 9.5 Key Words
- 9.6 Self Assessment Questions and Exercises
- 9.7 Further Readings

9.0 INTRODUCTION

School age is considered as a dynamic time of development and improvement since youngsters experience physical, mental and social changes. Advancing great wellbeing and nutrition in school kids are fundamental for powerful development and advancement. Lack of healthy nutrition affects the kids' prosperity and their capacity to learn and play regularly. It is in this manner imperative to have solid nourishment decisions. Lack of healthy nutrition (both under and over nourishment) is far reaching among school kids in many developing nations. It is a noteworthy risk to the typical development and advancement of kids. Under nutrition, both protein energy malnutrition and smaller scale supplement lacks, specifically influences numerous parts of kids' advancement. Specifically, it impedes their physical and intellectual development and expands vulnerability to disease, further expanding the likelihood of unhealthiness (Gragnolati et al., 2005). Inadequate eating regimen and undesirable eating examples may create serious types of ailing health in kids; these are protein energy lack of healthy nourishment, wholesome weakness, vitamin A insufficiency and iodine inadequacy issue. The higher predominance of obesity in school kids is because of their inadequate nutrition and absence of consciousness of appropriate eating habits. The issue of utilization of high caloric nourishments joined with latency has brought about an increase in

overweight alongside the increment in the frequency of non-transferable illnesses at a more youthful age in our nation. In this unit, you will learn about the aspects of nutrition during school age.

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9.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss physical development of school going children
- Describe nutritional status, food habits and nutritional requirements of school going children
- Explain the relationship between nutrition and academic performance
- Discuss the interventions to prevent malnutrition

9.2 PHYSICAL DEVELOPMENT OF SCHOOL GOING CHILDREN

As indicated by Nestle Nutrition Institute (NNI, 2014), the WHO studies have found that the problem of obesity and general wellbeing difficulties arise due to under nourishment and lead to many different ailments. Mounting proof legitimizes the need for early interventions for treating and averting gaining excess weight. Approximately four out of every ten Indian child experiences the ill effects of being overweight and under-weight. Enhancing the nourishment of school going children requires critical inputs which will also affect the physical, psychological and social capacities. Nourishment for school age is critical as it establishes a sound framework for grown-up life and will likewise affects the nature of human skill development in our nation. The arrangement of sufficient nutrition to youngsters is vital for an array of reasons, for example, enhancing development and improvement, mental limits and in general prosperity. The instructions of parents on nourishment and wellbeing will bolster and support enhancement of school kids through the building up the correct practice through direct nutrition training. The following tips may be followed in this regard:

- Keeping up a reasonable eating regimen and customary exercise is vital for all people, particularly school going children(6-12 years).
- These kids are required to gain different nourishments from every nutrition type to guarantee ideal intake of everything being equal in minerals. In the meantime, they may face new difficulties with respect to nutrition decisions and propensities.
- Choices about what to eat are incompletely dictated by what is given in school, at home, the impacts from companions at school, and the media, particularly TV.

- Poor nourishment bargains both the personal satisfaction of school going children yet in addition their capability to profit by training.
- Achieving ideal nourishment includes eating three dinners every day and two nutritious bites, and additionally restricting the intake of high sugar and high fat foods.
- Devouring liberal quantities of organic products, vegetables, lean meats and low fat dairy items, including excess servings of cheddar or yogurt to meet their calcium necessity, can likewise anticipate numerous therapeutic issues. This includes becoming overweight, creating feeble bones, and getting diabetes.
- Satisfactory nourishment of school going children will likewise guarantee they develop to their maximum capacity, and give the venturing stones to a solid life.

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9.2.1 Nutritional Status and Nutritional Requirements of School Going Children

The following points must be kept in mind while discussing the nutritional status and requirements of school going children:

- School going children develop altogether at a slower rate, while being physically dynamic.
- Subsequently, their wholesome needs are high and basic. Moreover, hereditary foundation, sexual orientation, body size and shape are very important determinants of their nutritional requirements.

An ongoing audit of research on the impacts of inadequacies in zinc, iodine, iron and folate on the intellectual improvement of school going children demonstrated that nourishment affects kids' capacity to think. For instance, inadequacies in iron and zinc have been related with weakness of neuropsychological capacity, impediment of development and advancement, lessened resistance and expanded helplessness to irresistible infections. Let's have a look at some of the fundamental supplements for ideal wellbeing:

Energy

Sugars and fats give energy for development and physical movement. Amid times of quick growth and movement in school going children, cravings increase and children will in general eat always. At the point when development becomes moderates, cravings lessen and kids eat less at these times. The cerebrum needs energy to work appropriately and thus the supply of glucose is significant and basic. Subjectively requesting errands, for example, schoolwork, require standard supplies of glucose to the cerebrum so as to upgrade psychological working and enhances memory and state of mind.

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Protein

Protein fabricates, keeps up and fixes body tissue. It is particularly critical for development. It's essential that guardians urge kids to eat a few servings of protein every day. Great sources of protein for kids include meat, poultry, and other dairy products.

Essential fatty acids

Inadequacy of essential fats may have a negative effect on school performance. In a randomized controlled preliminary research, it was found that a half year of intake of unsaturated fat helped dyslexic school going children improve their academic performance.

Calcium

Calcium is critical in building solid bones and teeth.

Iron

Youngsters require iron in for quickly increasing blood volume in growth years. Meats, fish, poultry, and breads and grains are the best sources of dietary iron.

The best nourishment advice to keep your youngsters sound incorporates urging them to:

- Eat breakfast each day to help keep up focus in class. A decent breakfast ought to have the capacity to give 33% of the aggregate every day energy necessity. A run of the mill breakfast incorporates an oat (for instance, rice, bread, and oats), protein-rich nourishment, for example, egg, a glass of milk and nutrient C rich organic products e.g. orange, and papaya. One experiment found that a medium-term and morning quick among school kids effects memory and decision making. Exact proof from research on the impacts of breakfast demonstrates that especially for more youthful youngsters, skipping breakfast can adversely affect both general energy levels and cognizance of school kids.
- Eat an assortment of nourishments so as to have sufficient nutrition intake.
- Balance the food you eat with physical movement.
- Choose an eating regimen with a lot of grain items, vegetables and organic products.
- Choose an eating regimen low in fat, immersed fat, and cholesterol. Purchase low-calorie and low-fat dinners, bites and deserts, low fat or skim drain and diet drinks.

- Choose an eating regimen that gives enough calcium and iron to meet their developing body's necessities.
- Teach youngsters since the beginning about nourishment, foods, drinks, good dieting and drinking tips. They ought to be instructed the end result for the food they devour.
- Choose an eating regimen moderate in sugars and salt. Abstain from giving a lot of sweet deserts, soda pops, organic product seasoned beverages, sugar-covered oats, chips or treat, as they have minimal dietary benefit.

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Snacking and school going children

Amid the grade school years, a more prominent portion of dinners might be destroyed from home in the school setting. A large portion of these tidbits are high fat foods. Bites may contribute up to a critical extent of aggregate every day energy and nourishment needs of the school going children. Subsequently poor snacking decisions result in an excessive number of high-energy, low-supplement foods. For instance, salty bites, for example, bags of crisps, might be poor incentive as they have negligible benefits except for instant gratification.

Youngsters who are both physically dynamic and developing need to refuel intermittently for the duration of the day. Guardians and parents have the basic job in helping youngsters settle on nutritious snacking decisions. Over snacking may result in loss of hunger for the primary dinner. A solid bite ought to be less in size or amount to the measure of an ordinary supper and should be taken no less than 2 hours before a customary meal.

9.2.2 Food Habits in School Going Children

There are many factors responsible for sickness in developing nations (that is, pulse, cholesterol, overweight, heftiness, low intake of foods grown from the ground, and iron deficiency), all of which are nourishment related. Arrangement of satisfactory eating regimen for the school going kid will improve their learning levels and in addition prevent many adult related diseases or issues like, ischaemic coronary illness, hypertension, a few sorts of malignancy and diabetes. Therefore, on a fundamental level, wholesome issues in the school going kid may transfer into adulthood. Some of the wholesome issues in this age include:

Weight

There is an increasing pattern of being overweight and hefty in school-going youngsters, for the most part owing to decreasing physical activities. Concentrate on decreasing stoutness and enhancing diet and physical action is a need in numerous nations.

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Eating disorders

There are numerous cases of anorexia nervosa and bulimia in this age group. Tricked by media, purposeful publicity and other social media influences, a few youngsters feel strain to be greatly thin. This outrageous proportion of weight control is accomplished by confining nourishment consumption.

Blood cholesterol levels

To diminish danger of coronary illness, youngsters should be careful of their diet and exercise from the get-go. They must ensure to:

- Consume an assortment of nourishment that is healthfully satisfactory.
- Consume enough calories to help their growth and development, and to reach or keep up alluring body weight.

Dental cavities

Dental cavities are caused by over indulging in sugary foods, for example, soda pops and dessert shop may incline school going children to poor dental wellbeing. The danger of tooth rot is most noteworthy with the consumption of a lot of sticky sugary and dull nourishments that adhere to the teeth (or precedent, desserts, soft drinks, lollies, and confections).

Iron deficiency

Iron inadequacy may occur in kids whose diet is iron deficient. Iron is an oxygen-transporting part of blood. Paleness in school-going youngsters may result in lower school performance because of disabled psychological improvement, poor learning absorption rate and general exhaustion. Researchers have shown that youngsters lacking in iron were twice as liable to score beneath normal on math tests, this finding was increasingly articulated among young ladies.

9.2.3 Interventions to Prevent Malnutrition in School Going Children

Parents need to set positive nourishment culture for school going children as they are very much affected by what they observe around themselves. The standards may be set through dinner arranging, keeping an assortment of foods in supply, and setting a genuine model. The key focuses to recollect as a parent/overseer include the following:

- Adequate nourishment will enable your kid to develop maximal insight (IQ) and prosperity.
- The youngster ought to be guided to settle on independent nourishment decisions and eat a variety of foods.
- Malnutrition and its outcomes can be avoided by eating the correct sorts and measures of nourishments.
- Encourage your kids to practice appropriate cleanliness consistently.

Role of parents and guardians

Parents and guardians are good examples for their kids. In this sense, any dietary tendencies shaped by the parent is probably going to be reflected in the youngster. A grown-up's demonstration of smart dieting examples can impact kids' eating patterns which reflects through the dinners and snacking options available at home. Guardians ought to give different food options and set up standards both for dinner and snacking.

Much of the time, nourishment needs will be sufficiently met if the food pyramid is alluded to in arranging family dinners. The Food Pyramid structure is to advance sound nourishment for all ages. It is intended to be a general manual for day by day nutrition decisions. The Food Pyramid shows that food options containing a great deal of fat, oil and desserts ought to be eaten sparingly.

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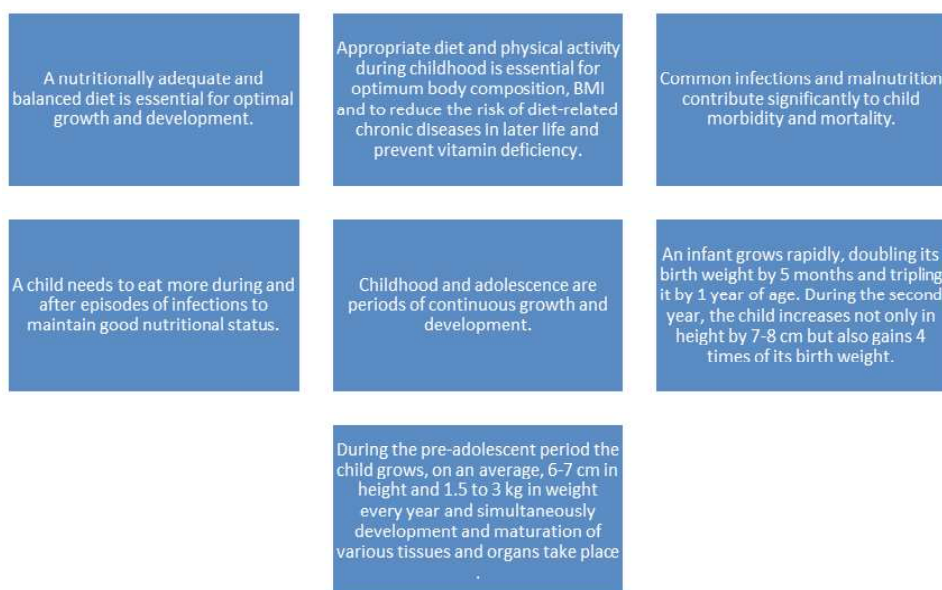


Fig. 9.1 Things to Keep in Mind While Planning Diet for Pre-Schoolers

9.2.4 Nutrition and Performance

Some food items are extremely essential for children in the pre-school age group. Let's discuss these food items in this section.

Calcium

Growing kids and young people require more calcium. Despite the fact that prescribed dietary stipends for calcium are around 600-800 mg/day, it is beneficial to give higher amounts of calcium for teenagers to accomplish high pinnacle bone mass. To achieve ideal pinnacle bone mass, it is prescribed to eat calcium rich food like milk and dairy items, millet (Ragi), til and so on. Young kids beneath the age of 5 years ought to be given less cumbersome foods, rich in energy and protein,

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for example, vegetables, beans, nuts, edible oil/ghee, sugar, and eggs. Vegetables including green leafy vegetables and locally accessible regular organic products ought to be a part of their everyday menu. Snacks make a valuable part to the supplement necessities, especially in more grown kids and young people.

School going children ought to expend a lot of energy to satisfy the high calcium necessities. Cooking oils/ghee (25-50g) ought to be expended. Overindulgence in fats might be evaded. Extreme salt admission ought to be kept away from especially by kids having a family ancestry of hypertension. Puberty is the helpless stage for adopting incorrect nourishment tendencies and unfortunate habits like smoking, biting tobacco or drinking liquor. These ought to be maintained a strategic distance from. Moreover, for proper utilization of nutrition rich diet, it is very important to encourage adjusted eating regimen, suitable way of lifestyle and contribution in physical action, for example, diversions/sports ought to be encouraged in school going children.

Basic youth contaminations like the diarrhoea, measles and pneumonia happen in relation with ailing health and add to about 70% of mortality cases. Amid times of contamination, youngsters will in general eat less because of decreased hunger.

Numerous youngsters upchuck much of the time. Supplements are likewise lost in pee and excrement. The unfortunate routine with regards to confining eating routine, including bosom encouraging, by the mother amid any disorder could additionally bother the issue. Subsequently, additional consideration is required in bolstering the kid suitably amid and after sickness to avert resulting healthful inadequacies.

For more affected children, eating a grown-up eating regimen, delicate cooked food might be offered at regular interims. The amount of the food might be increased, after the ailment has died down, till the first weight is recaptured.

Dehydration is a typical youth illness which prompts lack of hydration and some of the time passing. The children require redress of liquid and electrolyte lost by utilizing oral rehydration arrangement (ORS) alongside proper/sufficient bolstering. ORS can be set up by including a spot of salt (among thumb and forefinger) what's more, a teaspoon of sugar to a glass of consumable water. Home-made liquids, for example, rice kanji or buttermilk with salt can likewise be utilized. Amid diseases, kids ought to every now and again be given little amounts of liquids by mouth, including plain water. The eating routine of 1-year old kid with the dehydration ought to give energy of about 1000 Kcal/day. Calorie-rich, semi-strong, delicate weight control plans might be set up. Grown grains are effortlessly absorbable and give great nourishment. Fat and sugar help in diminishing the greater part of the eating regimens and make them energy thick. Milk might be blended with grain diet to keep away from lactose malabsorption. In the event that milk isn't consumed, it might be supplanted by an equivalent volume of curd/yogurt/

soymilk. Squashed vegetables might be included in the eating routine. Strengthening ends up simpler after the disease dies down. Around 6-8 feeds ought to be allowed amid the day with the goal that the additional nourishment (120-140 Kcal/kg) might be taken by the child with no trouble.

Check Your Progress

1. What is the consideration to be kept in mind in relation to a solid bite?
2. Mention the calcium dietary intake for teenagers.

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9.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. A solid bite ought to be less in size or amount to the measure of an ordinary supper and should be taken no less than 2 hours before a customary meal.
2. The prescribed dietary stipends for calcium are around 600-800 mg/day, it is beneficial to give higher amounts of calcium for teenagers to accomplish high pinnacle bone mass.

9.4 SUMMARY

- School age is considered as a dynamic time of development and improvement since youngsters experience physical, mental and social changes. Advancing great wellbeing and nutrition in school kids are fundamental for powerful development and advancement. Lack of healthy nutrition affects the kids' prosperity and their capacity to learn and play regularly.
- Approximately four out of every ten Indian child experiences the ill effects of being overweight and under-weight. Enhancing the nourishment of school going children requires critical inputs which will also affect the physical, psychological and social capacities. Nourishment for school age is critical as it establishes a sound framework for grown-up life and will likewise affects the nature of human skill development in our nation. The arrangement of sufficient nutrition to youngsters is vital for an array of reasons, for example, enhancing development and improvement, mental limits and in general prosperity.
- The following points must be kept in mind while discussing the nutritional status and requirements of school going children:
 - o School going children develop altogether at a slower rate, while being physically dynamic.

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- o Subsequently, their wholesome needs are high and basic. Moreover, hereditary foundation, sexual orientation, body size and shape are very important determinants of their nutritional requirements.
- The fundamental supplements for ideal wellbeing include: Energy, Protein, Essential fatty acids, Calcium, and Iron.
- Amid the grade school years, a more prominent portion of dinners might be destroyed from home in the school setting. A large portion of these tidbits are high fat foods. Bites may contribute up to a critical extent of aggregate every day energy and nourishment needs of the school going children. Subsequently poor snacking decisions result in an excessive number of high-energy, low-supplement foods. For instance, salty bites, for example, bags of crisps, might be poor incentive as they have negligible benefits except for instant gratification.
- There are many factors responsible for sickness in developing nations (that is, pulse, cholesterol, overweight, heftiness, low intake of foods grown from the ground, and iron deficiency), all of which are nourishment related. Arrangement of satisfactory eating regimen for the school going kid will improve their learning levels and in addition prevent many adult related diseases.
- Parents need to set positive nourishment culture for school going children as they are very much affected by what they observe around themselves.
- Parents and guardians are good examples for their kids. In this sense, any dietary tendencies shaped by the parent is probably going to be reflected in the youngster. A grown-up's demonstration of smart dieting examples can impact kids' eating patterns which reflects through the dinners and snacking options available at home. Guardians ought to give different food options and set up standards both for dinner and snacking.
- Growing kids and young people require more calcium. Despite the fact that prescribed dietary stipends for calcium are around 600-800 mg/day, it is beneficial to give higher amounts of calcium for teenagers to accomplish high pinnacle bone mass. To achieve ideal pinnacle bone mass, it is prescribed to eat calcium rich food like milk and dairy items, millet (Ragi), til and so on.

9.5 KEY WORDS

- **Essential fatty acids (EFA):** It refers to fatty acids like linoleic acid and alpha linolenic acid which are not made in the human body and must be supplied through the diet.
- **Trans-fatty acids:** These are mainly produced during hydrogenation of oils; a few also occur naturally in very small quantities.

- **Triglycerides (Neutral fat):** It refers to the major type of dietary fat and the principal form in which energy is stored in the body. A complex of fatty acids and glycerol.
- **Unsaturated fatty acids:** These refers to fatty acids in which there is a shortage of hydrogen atoms. The carbon atoms then become linked by double bonds. Unsaturated fatty acids are less stable than saturated fatty acids.
- **Visible fats:** These are fats and oils that can be used directly or in cooking.
- **Weaning foods:** It refers to foods which are used during gradual transition of the infant from breastfeeding to a normal diet.

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9.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Write a short note on physical development of school going children.
2. Briefly explain snacking for school going children.
3. List some of the focus areas for parent/overseer for setting an example for school going children.

Long-Answer Questions

1. Discuss the nutritional requirements of school going children.
2. Explain the nourishment advice to keep youngsters healthy.
3. Discuss some of the wholesome issues of school going children.
4. How are nutrition and performance related?

9.7 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 10 NUTRITION DURING ADOLESCENCE

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Structure

- 10.0 Introduction
- 10.1 Objectives
- 10.2 Changes of Growth, Assessment of Growth - Sexual Maturity Rating, Physical, Physiological and Psychological Changes in Adolescents
 - 10.2.1 Nutritional Needs of the Adolescents
 - 10.2.2 Changes Needed to Prevent Malnutrition in Adolescents
- 10.3 Answers to Check Your Progress Questions
- 10.4 Summary
- 10.5 Key Words
- 10.6 Self Assessment Questions and Exercises
- 10.7 Further Readings

10.0 INTRODUCTION

The dietary rules accentuate advancement of wellbeing and counteractive action of ailment, of all age groups with extraordinary spotlight on defenseless sections of the populace, for example, babies, kids and young people, pregnant and lactating ladies and the elderly. Other related components, which require thought are physical movement, human services, safe water supply and financial improvement, all of which emphatically impact nourishment and health. Childhood and youthfulness are times of constant development and advancement. In this unit, you will learn about nutrition during adolescence.

10.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss changes of growth and its assessment in adolescents
- Explain the nutritional needs of the adolescents
- Describe the changes needed to prevent malnutrition in adolescents

10.2 CHANGES OF GROWTH, ASSESSMENT OF GROWTH – SEXUAL MATURITY RATING, PHYSICAL, PHYSIOLOGICAL AND PSYCHOLOGICAL CHANGES IN ADOLESCENTS

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A newborn child develops quickly, growing from their birth in weight by 5 months and tripling it by 1 year of age. In the second year, the child increases in height by 7-8 cm as well as likewise gains multiple times since their birth. During the pre-adult period the kid develops, on a normal, 6-7 cm in tallness and 1.5 to 3 kg in weight each year and all the while improvement and development of different tissues and organs take place. Adolescence period (high school) is spread for 10 years. It is portrayed by fast development in height, weight, hormonal changes, sexual development and wide swings in feeling. Immature development spurt begins at around 10-12 years in young ladies and after two years in young men.

The yearly growth rates for height and weight are 9-10 cm and 8-10 kg. Improvement of basic bone mass is basic amid this period as this forms the ground for keeping up mineral intake of the bone in later life. The example and extent of different bodily needs like body water, muscle mass, bone and fat increases during the whole adolescence to reach grown-up qualities by around 18 years. Youthful young ladies are at more prominent physiological pressure than young men in lieu of feminine cycle. Their nourishing needs are of specific significance as they need to get ready for parenthood.

As your body is as yet developing, it's indispensable that you eat enough great quality foods and the correct sorts to meet your vitality and nourishment needs.

Being a young person can be fun, however it can likewise be troublesome as your body shape changes. These physical changes can be difficult to manage on the off chance that they aren't what you are anticipating. There can be weight related pressures from companions to be or look a specific way, and this may influence the foods the child eats. It is anything but a decent time to crash diet, as the child does not get enough nutrients, and may not achieve their maximum capacity. Following a sensible, all around adjusted eating regimen is a greatly improved choice, in the long haul.

As an adolescent, the child will turn out to be increasingly free and settle on their own nourishment decisions. They will spend time with their companions. Since they are as yet growing, they have to take additional consideration to get enough quantities of some essential nutrients and minerals to feel better and be solid.

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10.2.1 Nutritional Needs of the Adolescents

Eating three ordinary suppers daily with a few snacks will enable the child to meet their nutrients needs. Skipping suppers implies that the child will pass up nutrients, minerals and starches, which can result in them lacking energy and making it difficult for them to focus. Here is a manual for help the child comprehend the estimation of what requires to be eaten.

Breads, grains and oats are starches that give vitality to mind and muscles. They're additionally a superb source of fiber and B nutrients. Without enough starches the child may feel tired and rundown. Attempt to incorporate a few sugars at every supper time.

Leafy foods have bunches of nutrients and minerals which help support insusceptible framework and shield them from becoming ill. They're likewise imperative for solid skin and eyes. It's suggested the adolescent eats two serves of products of the soil serves of vegetables daily.

Meat, chicken, eggs, nuts and vegetables (e.g. beans and lentils) are great sources of iron and protein. Iron is expected to make red platelets, which bear oxygen in the body. During high school years, the female children begin to menstruate, or get their period, and this prompts loss of iron. In the event that they don't get enough iron, they may develop weakness, a condition that can make them feel worn out and bleary eyed and shy of breath. Protein is required for development and to keep the muscles solid. Not eating enough protein when the children are as yet developing, or experiencing pubescence, can prompt postponed or hindered tallness and weight. Insufficient protein is regular when the child goes on strict weight control plans. Incorporate meat, chicken, fish or eggs in the eating routine no less than two times every day. Fish is vital for their cerebrum, eyes and skin.

In the event that the child is a veggie lover or vegetarian and don't eat meat, there are different approaches to meet their iron needs, for instance, with foods like heated beans, beats, lentils, nuts and seeds.

Dairy foods like milk, cheddar and yogurt help to assemble bones and teeth and keep the heart, muscles and nerves working legitimately. The adolescents require three and a half serves of dairy sustenance per day to address their needs.

Eating excessively fat and oil can result in putting on weight. Efforts to utilize oils in little sums for cooking or serving of mixed greens dressings must be made. Other high-fat nourishments like chocolate, chips, cakes and browned foods can increase weight without giving the body any nutrients.

Liquids are additionally an imperative part of the eating regimen. Drink water to keep hydrated, so that the child won't feel so worn out or parched. It can

likewise counteract stoppage. It is better not to drink flavoured waters or sports drinks since they can prompt more weight gain.

Breakfast is the most essential supper of the day. It can help with memory and learning at school, and give the child vitality to study and play. Regular breakfast eaters will in general have a more beneficial weight than the individuals who skip breakfast.

Search for breakfast grains that are high fiber and low fat and with not all that much included sugar or salt. Here are some sound breakfast choices:

- porridge with nectar and cinnamon
- muesli with yogurt
- new foods grown from the ground
- higher-fiber grains
- multigrain toast with a bubbled or poached egg
- heated beans on toast
- raisin toasts
- pita bread with olives and feta
- softened cheddar and vegemite on toast or an English biscuit
- crumpets with stick
- banana milkshake or organic product smoothie
- hotcakes with yogurt and natural product

10.2.2 Changes Needed to Prevent Malnutrition in Adolescents

Malnutrition whether in the form of under or over-nutrition can be tackled if meals are properly planned. Snacking is one of the important factors affecting adolescent health. In this section, we will look at some meal recommendations related interventions.

But first let us briefly look at the malnutrition issues in adolescents.

India is home to 243 million adolescents – children aged 10 to 19 years – the most adolescents of any country. While there are many malnutrition related factors affecting adolescents. Prominent ones include low Body Mass Index, overweight and obesity, and other nutrient related deficiencies.

The major areas where change is required include:

- Avoidance or prevention of adolescent pregnancies
- Adolescent's access to food and control
- Hygiene and sanitation
- Gender equity

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The following points will help you understand better the deal with adolescents for bringing changes to prevent malnutrition.

- **Do** involve youth in the design of program messages and intervention strategies—they are your best source of information about effective communication techniques (e.g., “Nutrition is boring, but food is fun.”)
- **Do** segment the target adolescent population by narrow age bands (e.g., parents of 10-12 yr olds are usually responsible for diet and nutrition decisions for this age group, while 15-18 yr olds may purchase and prepare food for themselves and the household). How to reach young people will vary by multiple determinants of the population (e.g., in/out of school; at worksites; through community recreational centers or marriage registries; teen pregnancy programs, etc.)
- **Do** deliver integrated programs. Work with other sectors to incorporate nutrition interventions to strengthen the results of broader investment in youth development. Teaching adolescent boys how to cook as part of a life skills curriculum breaks down traditional gender barriers and increases awareness of good nutrition. Sports programs for girls may benefit from actions to improve the nutritional status of their adolescent participants.
- **Do** use nutrition education and behavior change communications strategies for healthy lifestyles as entry points for reaching adolescents with information on more sensitive topics such as human sexuality, STIs, and substance abuse.
- **Don’t** forget the boys. Depending on the setting, they experience the same or greater levels of malnutrition as girls in adolescence. In addition, providing accurate information about diet and nutrition needs at this stage may insure better care and health outcomes for women and children in their households later on.

School snacks are equally important meals. The children should ask themselves questions like does your mother or father for the most part make your school lunch? On the off chance that the child don’t care for what the parents make for them. It is essential that they converse with them about what they might want. Disclose to them what sandwich fillings they like, or what is their most loved solid snacks are.

Here are a few recommendations:

- Chicken, ground carrot, cucumber and cream cheddar pita bread
- Turkey, cheddar and plate of mixed greens on multigrain bread with cranberry sauce
- Vegetable and lentil soup in a canteen with a bread roll
- Smoked salmon, plate of mixed greens and cream cheddar bagel

- Remaining pasta with heaps of cooked vegetables
- Quiche and plate of mixed greens
- Cheddar and plate of mixed greens sandwich
- Bubbled egg and plate of mixed greens on multigrain with a smear of mayonnaise
- Ham, cheddar and spinach wrap
- Chilly cooked cheddar, serving of mixed greens and lean meat quesadillas
- Chicken with avocado and plate of mixed greens in a grainy bread roll
- Meat, tomato and lettuce sandwich with tomato chutney or salsa

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Eating for study

At the point when there are exams or tests at school, the brain needs additional exercise. Eating well nourished foods is likewise connected to better fixation. Here are a few hints for eating more advantageous in such cases:

- Eat little regular dinners.
- Simple and advantageous nutritious suppers include: solidified meals, tinned soups, nutty spread sandwiches, breakfast grain, cheddar sandwiches, fish or chicken and serving of mixed greens sandwiches, prepared beans or eggs on toast.
- Snacking on foods like chips and lollies can make the child feel surly, crabby and low in energy. That is not what they need while they are learning. More nourishing snacks like yogurt, nuts, dried natural product, new organic product, plain popcorn or vegie sticks are useful.
- Individuals use caffeine as a stimulating beverage to feel increasingly wakeful or alarm. An excessive amount of caffeine from espresso, tea, cola and caffeinated beverages can disturb your dozing designs, send your heart dashing, making it hard to center or potentially cause anxiety in a few people. Have a go at adhering to a couple some espresso or tea daily, or attempt decaffeinated espresso or natural teas as an option. Appreciate cola or caffeinated drinks just incidentally as they have excessively sugar and minimal wholesome advantage.
- Drink a lot of water. When one is dehydrated they feel tired.
- Eat just when hungry. Know about your hunger pangs, similar to stomach aches, protesting guts, dry mouth and so on. In the event that you require a break and don't have food cravings, have a beverage of water or go for a walk.
- Regular exercise enhances your blood course, which keeps oxygen and supplements streaming to the body and brain helping to focus.

Eating for game and play

Eating great foods can help in exercise by building up stamina and strength. The following foods will help in such cases:

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- breakfast grain with drain and organic product
- dried leafy foods
- yogurt and natural products
- English biscuit with nutty spread and nectar
- banana and nutty spread sandwich
- new organic product smoothie with milk or preferably yogurt
- low-fat muesli bar
- little biscuits made with oats or wholemeal flour and natural product or vegetables
- low-fat custard and organic product
- raisin toast and cream cheddar
- sushi handrolls
- organic product scone
- trail blend with dried organic product, nuts, seeds and some choc chips.

Accomplishing a solid weight

It is anything but difficult to snack on bread rolls, potato chips, cakes, pies, doughnuts or chocolate bars when one is hungry, yet consistently picking those nourishments will make one put on excess weight.

Different things to avoid are drinks with bunches of sugar, for instance, natural product juice, agreeable, soda pops and caffeinated drinks. The following is the number of teaspoons of sugar present in 250 ml of drinks:

250 ml drink	No. of teaspoon sugar *
orange juice	4
coke cola	5
low fat milk	3
weakened cordial	4 ½
sports drink	3 ½
frosted tea	4
energy drink	5

Dietary problems

Individuals with a dietary problem encounter outrageous unsettling influences in their eating conduct and related considerations and emotions. They have a staggering drive to be thin and a dreary dread of putting on weight and losing command over their eating. Dietary problems can cause genuine physical and mental issues. They are not advisable for a healthy lifestyle.

Dietary problems can be adequately treated and the before the treatment the better the recuperation. Families and companions regularly require support and help as well, and are associated with the treatment procedure.

A physical wellbeing check is basic to preclude conceivable medicinal confusions that can emerge from the condition. It is additionally critical to have the correct data about eating regimen and about smart dieting, as there is a lot of wrong or misconstrued data about nourishment and sustenance out there.

Chatting with an expert advocate is important to help change the adolescent's choices, emotions and practices identified with the dietary issue, and to assist manage the distressing things that may occur in their life, similar to relationship issues, school issues and different things.

In the event that the child has inconveniences like serious wretchedness or uneasiness, prescriptions might be helpful.

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Check Your Progress

1. When does immature development spurt begins in young ladies and men?
2. What does iron make in the human body?
3. Mention snacking healthy options for adolescents.

10.3 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Immature development spurt begins at around 10-12 years in young ladies and after two years in young men.
2. Iron is expected to make red platelets, which bear oxygen in the body.
3. Nourishing snacks for adolescents include yogurt, nuts, dried natural product, new organic product, plain popcorn or vegie sticks.

10.4 SUMMARY

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- The dietary rules accentuate advancement of wellbeing and counteractive action of ailment, of all age groups with extraordinary spotlight on defenseless sections of the populace, for example, babies, kids and young people, pregnant and lactating ladies and the elderly. Childhood and youthfulness are times of constant development and advancement.
- A newborn child develops quickly, growing from their birth in weight by 5 months and tripling it by 1 year of age. In the second year, the child increases in height by 7-8 cm as well as likewise gains multiple times since their birth. Amid the pre-pre-adult period the kid develops, on a normal, 6-7 cm in tallness and 1.5 to 3 kg in weight each year and all the while improvement and development of different tissues and organs take place.
- Adolescence period (high school) is spread for 10 years. It is portrayed by fast development in stature what's more, weight, hormonal changes, sexual development and wide swings in feeling. Immature development spurt begins at around 10-12 years in young ladies and after two years in young men.
- As your body is as yet developing, it's indispensable that you eat enough great quality foods and the correct sorts to meet your vitality and nourishment needs. Being a young person can be fun, however it can likewise be troublesome as your body shape changes. These physical changes can be difficult to manage on the off chance that they aren't what you are anticipating.
- Eating three ordinary suppers daily with a few snacks will enable the child to meet their nutrients needs. Skipping suppers implies that the child will pass up nutrients, minerals and starches, which can result in them lacking vitality or thinking and make it difficult for them to focus.
- Breakfast is the most essential supper of the day. It can help with memory and learning at school, and give the child vitality to study and play. Regular breakfast eaters will in general have a more beneficial weight than the individuals who skip breakfast.
- At the point when there are exams or tests at school, the brain needs additional exercise. Eating well nourished foods is likewise connected to better fixation.
- Eating great foods can help in exercise by building up stamina and strength. There are certain foods that will help in such cases.

- It is anything but difficult to snack on bread rolls, potato chips, cakes, frankfurter moves, pies, doughnuts or chocolate bars when one is hungry, yet consistently picking those nourishments will make it less demanding to put on excess weight in adolescents.
- Individuals with a dietary problem encounter outrageous unsettling influences in their eating conduct and related considerations and emotions. They have a staggering drive to be thin and a dreary dread of putting on weight and losing command over their eating. Dietary problems can cause genuine physical and mental issues. They are not advisable for a healthy lifestyle.

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10.5 KEY WORDS

- **Bone mass:** It is a measure of the amount of minerals (mostly calcium and phosphorous) contained in a certain volume of bone.
- **Platelets:** These are made in your bone marrow along with your white and red blood cells.
- **Feminine cycle:** It refers to the menstrual cycle which is the regular natural change that occurs in the female reproductive system (specifically the uterus and ovaries) that makes pregnancy possible.

10.6 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. Mention some sound breakfast choices for adolescents.
2. Suggest dietary choices for game and play for adolescents.
3. Write a short note on dietary problems.

Long-Answer Questions

1. Discuss the changes of growth and its assessment for adolescents.
2. Describe the nutritional needs of the adolescents.

10.7 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.
Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP
India.

NOTES

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery
Publishing House.

Websites

<http://unicef.in/Whatwedo/33/Adolescents-Nutrition>

<http://pib.nic.in/newsite/printrelease.aspx?relid=160639>

http://web.worldbank.org/archive/website01213/WEB/0_CO-82.HTM#section2

UNIT 11 NUTRITION IN ADULTHOOD

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- 11.2 Nutrition Requirements According to Mode of Activity
- 11.3 Nutrients and Exercise to be Encouraged or Limited
- 11.4 Nutrition and Health of Women: General Nutritional Problems of Women
 - 11.4.1 Nutrition and Premenstrual Syndrome (PMS)
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- 11.6 Answers to Check Your Progress Questions
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11.0 INTRODUCTION

National Nutrition Monitoring Bureau (NNMB) surveys indicate that the daily intake of all foods except cereals and millets (396g) in Indian households is lower than the Recommended Dietary Allowances or RDA. On the other side of the spectrum of malnutrition, diet-related non-communicable diseases are commonly seen. With increasing urbanization, energy-rich diets containing higher amount of fat and sugar, which also provide less dietary fibre and complex carbohydrates, are being frequently consumed, particularly by high income groups. In addition, the urban population is turning to be more sedentary with little physical activity. Consumption of alcohol, providing empty calories, and tobacco use is also common among them. Hence, prevalence of disorders like obesity, heart disease, hypertension (high blood pressure) diabetes and certain types of cancers is on the increase. This unit includes a discussion on the nutrition related choices and addressing the requirements for nutrients B12 and D, incessant ailment, surface

alterations, and perceiving the impact of ethnic and religious custom on nourishment decisions. In this unit, you will learn about importance of nutrition in adulthood, with a focus on general nutritional problems in women and the concept of infertility.

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11.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss the nutritional requirements for adults according to mode of activity
- Explain the nutrients and exercise to be encouraged or discouraged
- Describe the relation of nutrition to the health of women
- Discuss infertility in women

11.2 NUTRITION REQUIREMENTS ACCORDING TO MODE OF ACTIVITY

Attaining a healthy lifestyle is merely a job of eating the right nutrients. Amongst other factors, physical activity has a dominant influence. The mode of activity can be defined as the level of physical exertion that a task requires. Mode of activity can be categorized into three groups:

- **Sedentary:** A sedentary activity level describes someone who gets little to no exercise
- **Moderate:** It refers to a level of less than the 2 1/2 hours per week of the moderate aerobic activity
- **Heavy:** It refers to vigorous physical activity for at least one hour and 15 minutes every week

The level of activity as you have seen above, will result in the body spending energies at different levels. Of course, this must be balanced with the help of right balanced diet including appropriate nutrients intake. You will learn about the nutritional requirements for adults according to the mode of activity as given by the National Institute of Nutrition.

Table 11.1 Balanced Diet for Adults - Sedentary/ Moderate/ Heavy Activity
(Number of Portions)

Nutrition in Adulthood

	g/portion	Type of work					
		Sedentary		Moderate		Heavy	
		Man	Woman	Man	Woman	Man	Woman
		No. of portions					
Cereals & millets	30	12.5	9	15	11	20	16
Pulses	30	2.5	2	3	2.5	4	3
Milk & milk products	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	2	2	2	2	2
Green leafy vegetables	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	4	4	6	6	11	9
Fat	5	5	4	6	5	8	6

To calculate the days requirement of above mentioned food groups for an individual, multiply grams per portion with number of portions.

Source: Dietary Guidelines for Indians- A Manual (2011) by National Institute of Nutrition Hyderabad

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Table 11.2 Sample Meal Plan for Adult Man (Sedentary)

Meal Time	Food Group	Raw	Cooked Recipe	Servings Amounts
Breakfast	Milk	100 ml	Milk	1/2 Cup
	Sugar	15 g	Tea or Coffee	2 Cups / 1 Cup
	Cereals	70 g	Breakfast Item	
	Pulses	20 g		
Lunch	Cereals	120 g	Rice	2 Cups
	Pulses	20 g	Pulkas	2 Nos.
	Vegetables	150 g	Dhal	1/2 Cup
	Vegetables	50 g	Veg. curry	3/4 Cup
	Milk	100 ml	Veg. salad	7-8 Slices
Tea	Cereals		Curd	1/2 Cup
	Milk	50 ml	Tea	1 Cup
	Sugar			
Dinner	Cereals	120 g	Rice	2 Cups
	Pulses	20 g	Pulkas	2 Nos.
	Vegetables	150 g	Dhal	1/2 Cup
	Milk (Curd)	50 ml	Veg. curry	3/4 Cup
	Vegetables	50 g		
	Fruit	100 g	Seasonal	1 Medium

1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish Use 25 g visible fat and <5g of salt during preparation of meal per day.

Breakfast Items: Idli - 4 Nos. / Dosa - 3 Nos. / Upma - 1-1/2 Cup / Bread - 4 Slices/ Porridge - 2 Cups / Corn flakes with milk - 2 Cups

Snacks: Poha - 1 Cup /Toast - 2 Slices Dhokla - 4 Nos.

Source: Dietary Guidelines for Indians- A Manual (2011) by National Institute of Nutrition Hyderabad

Table 11.3 Sample Meal Plan for Adult Woman (Sedentary)

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Meal Time	Food Group	Raw	Cooked Recipe	Servings Amounts
Breakfast	Milk	100 ml	Milk or	1/2 Cup
	Sugar	10 g	Tea or	2 Cups
			Coffee	1 Cup
	Cereals	50 g	Breakfast Item	
Lunch	Pulses	20 g		
	Cereals	100 g	Rice	1 Cup
			Pulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
Tea	Vegetables	50 g	Veg. salad	7-8 Slices
	Milk	100 ml	Curd	1/2 Cup
	Cereals	50 g	Snack	
	Milk	50 ml	Tea	1 Cup
Dinner	Sugar	10 g		
	Cereals	100 g	Rice	1 Cup
			Phulkas	2 Nos.
	Pulses	20 g	Dhal	1/2 Cup
	Vegetables	100 g	Veg. curry	1/2 Cup
	Milk (Curd)	50 ml		
	Vegetables	50 g		
Fruit	100 g	Seasonal	1 Medium	

1 Cup = 200 ml

Note: For Non-Vegetarians - Substitute one pulse portion with one portion of egg/meat/chicken/fish Use 20 g visible fat and <5g of salt during preparation of meal per day.

Breakfast Items: Idli - 3 Nos. / Dosa - 2 Nos. / Upma - 1 Cup / Bread - 3 Slices / Porridge - 1-1/2 Cups / Corn flakes with milk - 1-1/2 Cup. Snacks: Poha - 1 Cup / Toast - 2 Slices Dhokla - 4 Nos

Source: Dietary Guidelines for Indians- A Manual (2011) by National Institute of Nutrition Hyderabad

Table 11.4 Recommended Dietary Allowance for Indians (Macronutrients and Minerals)

Group	Particulars	Body weight kg	Net Energy Kcal/d	Protein g/d	Visible Fat g/day	Calcium mg/d	Iron mg/d
Man	Sedentary work	60	2320	60	25	600	17
	Moderate work		2730		30		
	Heavy work		3490		40		
Woman	Sedentary work	55	1900	55	20	600	21
	Moderate work		2230		25		
	Heavy work		2850		30		
	Pregnant woman		+350	+23	30	1200	35
	Lactation 0-6 months		+600	+19	30	1200	21
	6-12 months		+520	+13	30		

Source: Dietary Guidelines for Indians- A Manual (2011) by National Institute of Nutrition Hyderabad

11.3 NUTRIENTS AND EXERCISE TO BE ENCOURAGED OR LIMITED

The examinations of food intakes by grown-ups clarify that extraordinary exertion will be expected to both give and empower admission of more natural product, vegetables, low-fat dairy items, and entire grains while constraining introduction to and the utilization of nourishments high in sugar, strong fats, and sodium and of refined grains. More prominent admission of leafy foods will enhance admission of nutrient C, carotenoids (dull green and orange vegetables), folate (dim green vegetables, oranges, and vegetables), nutrient B6 (vegetables and bananas), magnesium (vegetables), potassium, and dietary fiber (most nonstarchy products of the soil). Higher admissions of low-fat milk or yogurt will enhance admissions of magnesium, calcium, potassium, Vitamin B12, and, whenever braced, Vitamin D. Consideration of sustained breakfast oats will give some crystalline Vitamin B12. The incorporation of all the more entire grains will enhance admissions of nutrient B6, magnesium, and dietary fiber.

Food Beliefs and Taboos

Food habits are formed early in childhood, passed on from the elders in the family and perpetuated to adulthood. Food beliefs either encourage or discourage the consumption of particular type of foods. There can be neutral, harmless or harmful practices. Unfortunately, most of the food fads and prejudices (taboos) are associated with women and children, who are also the most vulnerable to malnutrition. Exaggerated beneficial or harmful claims in respect of some foods, without scientific basis constitute food fads. In addition, the belief of heat producing and cold inducing foods is widely prevalent. Some examples are jaggery, sugar, groundnuts, fried foods, mango, bajra, jowar, maize, eggs and meat. Papaya fruit is strongly suspected to lead to abortion, though there is no scientific basis. Buttermilk, curd, milk, green gram dhal, green leafy vegetables, ragi, barley flour and apples are considered as cold inducing foods which are actually nutritious. Vegetarianism is often practiced in India on religious grounds. Since vitamin B is present only in 12 foods of animal origin, vegetarians should ensure an adequate consumption of milk. During certain illnesses like measles and diarrhea, dietary restriction is practiced. This can aggravate malnutrition in young children.

Exercise and Physical Activity

Grown-ups beyond 20 years old ought to target at least 30-45 minutes of physical movement of moderate force, (for example, energetic strolling 5-6 km/hr) 5-6 days of the week. More noteworthy medical advantages can be acquired by participating in physical movement of longer length or increasingly fiery force, for

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example, running, running, cycling and swimming. Stationary individuals leaving on a physical movement program ought to embrace a moderate power movement of brief length to begin with and step by step increment the term or on the other hand force. Other everyday exercises like strolling, housework, cultivating, will be valuable in weight decrease as well as for bringing down of pulse and serum triglycerides. It additionally lifts HDL (great) cholesterol in blood. Straightforward change in way of life like purposely scaling the stairs as opposed to utilizing the lift and strolling for short separation rather than utilizing a vehicle could likewise gigantically help in expanding our physical movement.

Exercise program ought to incorporate 'warm up' and 'chill off' periods each going on for 5 minutes. Amid exercise, the power of activity ought to guarantee 60-70% expansion in heart rate. Men beyond 40 years old years, ladies beyond 50 years old years and individuals at high hazard for interminable infections like coronary illness and diabetes should initially counsel a doctor before taking part in a program of incredible physical action, for example, running and swimming.

According to WHO, a healthy diet for adults contains:

- Fruits, vegetables, legumes (e.g. lentils, beans), nuts and whole grains (e.g. unprocessed maize, millet, oats, wheat, brown rice).
- At least 400grams (5 portions) of fruits and vegetables a day. Potatoes, sweet potatoes, cassava and other starchy roots are not classified as fruits or vegetables.
- Unsaturated fats (e.g. found in fish, avocado, nuts, sunflower, canola and olive oils) are preferable to saturated fats (e.g. found in fatty meat, butter, palm and coconut oil, cream, cheese, ghee and lard). Industrial trans fats (found in processed food, fast food, snack food, fried food, frozen pizza, pies, cookies, margarines and spreads) are not a part of a healthy diet.
- Less than 5 g of salt (equivalent to approximately 1 teaspoon) per day and use iodized salt.

Check Your Progress

1. What does a moderate level of physical activity mean?
2. State the RDA for visible fat for an average woman weighing 55 kgs doing heavy work.
3. List some food items which are considered cold inducing foods but are actually nutritious.

11.4 NUTRITION AND HEALTH OF WOMEN: GENERAL NUTRITIONAL PROBLEMS OF WOMEN

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Women's nutritional needs change during menstruation, pregnancy, breastfeeding and menopause. A woman's reproductive life means that her nutritional needs differ greatly from those of a man.

Good nutrition means eating a wide variety of foods every day, which isn't possible on a restrictive diet.

11.4.1 Nutrition and Premenstrual Syndrome (PMS)

The interplay of hormones throughout a woman's menstrual cycle affects her body and state of mind. Energy intakes are generally higher in the premenstrual phase and some women also have food cravings as their period approaches.

Eating high-protein foods every few hours can often temper or stop food cravings. This should not be done at the expense of other food groups, especially carbohydrates, which should form the basis of the diet.

Fluid retention is common in the days leading up to a woman's period because certain hormones encourage the body to hold salt (sodium). The more sodium the body holds, the more fluid is retained in the tissues.

Other common symptoms of premenstrual syndrome (PMS) include moodiness, tiredness and constipation. Taking B-group vitamins, particularly vitamin B6, may help, but more research is needed to confirm this.

Light to moderate exercise, such as a 30-minute brisk walk each day, has also been shown to noticeably reduce symptoms of PMS.

11.4.2 Iron and Anaemia

Iron is a mineral that works with other substances to create haemoglobin, the compound that carries oxygen in the blood. Women and men metabolise iron from food at roughly the same rate. However, while men need around 8 mg of iron in their daily diet, women need up to 18 mg (or 27 mg if pregnant).

Women need more iron than men to make up for the amount of iron they lose in their menstrual period. Around 1 mg of iron is lost for every day of bleeding.

Iron deficiency is the most common nutrient deficiency in women. Insufficient iron can lead to anaemia. Common symptoms of anaemia include tiredness and breathlessness. Iron is especially important during pregnancy.

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Sources of iron

Good dietary iron sources include:

- Red meat, chicken and fish
- Fortified cereals
- Legumes and nuts
- Leafy green vegetables.

Iron absorption can be impaired by very high-fibre diets, alcohol, the tannic acid in tea and concentrated sources of calcium (for example, calcium supplements).

11.4.3 Vitamins, Minerals and Pregnancy

Eating healthily during pregnancy is important to meet the nutritional needs of the developing baby and for the mother's own wellbeing. However, this doesn't mean 'eating for two' – it is the quality of the diet that is important, not the quantity of food eaten.

Eating a variety of foods from each of the key food groups is generally enough to meet both mother and baby's requirements. Special attention should be given to calcium, folic acid (folate), iron, zinc, iodine and vitamin C.

Calcium

Although a developing baby needs a lot of calcium, physiological changes during pregnancy help to protect the mother's bones, so there is no need for extra dietary calcium during pregnancy. However, it is important to include at least two to three serves of dairy products or equivalent high-calcium foods every day.

Good sources of calcium include milk, cheese, yoghurt and fish with edible bones (for example, salmon and sardines).

Folic acid (folate)

Extra folic acid is needed for the development and growth of new cells. Research suggests that insufficient folic acid at the time of conception and in the first trimester of pregnancy can increase the risk of neural tube defects in the unborn baby.

Folate is present in a variety of vegetables and fruits, as well as legumes, nuts, yeast extracts such as Vegemite, and fortified foods such as bread and some breakfast cereals.

Iron

Iron requirements increase significantly during pregnancy as maternal blood volume increases and the baby's blood system is developing. Iron deficiency in pregnant women increases the risk of having a preterm or low birth weight baby, which can have a negative impact on the short and long-term health of the baby.

The best source of iron is red meat, with smaller amounts in chicken and fish. Iron is also present in plant foods such as legumes, nuts, wholegrain breads and cereals, and green leafy vegetables, but it is not absorbed as well from these foods.

Eating foods rich in Vitamin C alongside iron-rich foods can improve iron absorption. Iron supplements are frequently prescribed for pregnant women if they are unable to meet their requirements through food alone.

Zinc

Zinc nutrient is needed to maintain the health of cells. Taking iron supplements may interfere with the absorption of zinc, so women taking iron supplements should continue to eat iron-rich foods, which are also a good source of zinc.

Iodine

Iodine is needed for normal mental development of the baby, but it can be difficult to get enough from food. Ways of increasing iodine intake include using iodised salt, eating fish and seafood weekly (see your health professional for advice about safe types and amounts of fish), or using a multivitamin supplement that contains iodine and is safe for pregnancy.

Vitamin C

Vitamin C is important for normal gum, tooth, bone and body tissue formation. One of the best sources of Vitamin C is oranges, but it is also found in other fruits, particularly papaya and strawberries, and a variety of vegetables, including red capsicum and broccoli.

11.4.4 Nutrition During Breastfeeding

A healthy diet is important during breastfeeding because the mother must provide for her own nutrient requirements, as well as for the production of breastmilk. Particular attention needs to be paid to protein, calcium, iron, vitamins and fluids.

The best advice is to eat a variety of foods from each of the key food groups each day. The amount of extra food will vary according to appetite needs and weight loss. Aim to lose weight gradually until the mother has reached her pre-pregnant weight.

Women who were anaemic during pregnancy should pay special attention to iron-rich foods as they will need to replace their iron stores. It may be necessary to continue taking iron supplements – be advised by their doctor.

11.4.5 Calcium and Osteoporosis

Osteoporosis is a disorder characterised by thinning of the bones until they are weak and easily fracture or break. Women are at greater risk of developing osteoporosis than men, particularly after menopause, because oestrogen levels are reduced.

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Many factors are involved in the development of osteoporosis, including:

- Low calcium intake during the growing years increases susceptibility to osteoporosis later in life. Bone strength in later life depends on the development of bones earlier in life. Adequate calcium intake during youth is essential to achieve peak bone mass
- Salt, caffeine and alcohol intake may interfere with the balance of calcium in the body by affecting the absorption of calcium and increasing the amount lost in the urine. Moderate alcohol intake (one to two standard drinks per day) and moderate tea, coffee and caffeine-containing drinks (no more than six cups per day) are recommended. Avoid adding salt at the table and in cooking
- Exercise, or the lack of it, can affect the development of osteoporosis
- Maintaining a low body weight (body mass index (BMI) less than 18) has been associated with the development of osteoporosis.

11.4.6 Vitamin D and Calcium

Vitamin D increases calcium absorption and is required for normal bone metabolism. The main source of vitamin D for most people is sunshine.

Women who have very low levels of sunlight exposure or have naturally very dark skin are at risk of vitamin D deficiency. Those affected may include women who cover most of their body when outdoors, shift workers, those who are unable to regularly get out of their house or women in residential care. Women who have certain medical conditions or are on some medications may also be affected.

It is important to balance the need to maintain adequate vitamin D levels with the risk of skin cancer from too much sun exposure. A sensible balance of sun protection and exposure can ensure that women are not at risk of vitamin D deficiency.

Good dietary sources of vitamin D are margarine, eggs and oily fish (such as mackerel and sardines).

Good sources of calcium include dairy foods, calcium-fortified soymilk and fish with edible bones. For women who can't eat these foods, calcium supplements may be desirable.

11.4.7 Phytoestrogens

Phytoestrogens have been linked to a range of health benefits, especially for women. They are natural substances found in certain plant foods including:

- Whole grains, including cracked wheat and barley
- Flaxseed (linseed)
- Sesame seeds

- Nuts, including almonds
- Legumes, especially soy and chickpeas
- Alfalfa sprouts
- Herb teas, especially sage and aniseed
- Extra virgin olive oil

Phytoestrogens are natural oestrogen-like substances. Oestrogen is a hormone that is necessary for optimal health.

There is a link between oestrogen levels and the development of heart disease, cancer and osteoporosis. At present, there is no evidence that increasing the intake of phytoestrogen will prevent heart disease, cancer and osteoporosis.

11.4.8 Hormonal Changes During Menopause

Menopause is a time of many changes for women, both biologically and environmentally. As the woman approaches and enters menopause, their hormones change. The way the body processes certain nutrients changes. There is a need for more of some nutrients and less of others. The way the woman consume foods should be altered to optimize the way the body processes these nutrients.

These changes coincide with a time where the female's habits and schedule may change as well. Perhaps as the children have grown and the parent is cooking less, the mother is eating out or eating alone more often, or they may have encountered health issues that need management, taking extra time and creating additional stress.

No matter the circumstances, there are steps menopausal women can take to preserve their health and prevent diseases and disabilities as they age.

Eating Right During Menopause

For women, menopause is a reality check that their body is changing. This is a time to take care of themselves by making healthy lifestyle choices. Eating well and being physically active will make this midlife transition easier.

About Menopause

Every woman has to face this "change of life" at the time of her last period. On average, women reach menopause at age 51, but it can happen earlier or later. Menopausal symptoms vary with every woman. Common symptoms include hot flashes, night sweats, weight gain around the middle, sleep disturbances and mood changes. However, some women go through menopause with no real symptoms.

What causes menopause? Hormones. As women age, ovaries produce less estrogen and progesterone, two of the main hormones for reproduction. As estrogen levels go down, one of the first signs of "menopausal transition" is irregular periods in which bleeding is unusually heavy or light; the time between periods also may become longer.

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Weight Gain with Menopause

Due to lowering hormone levels and the natural aging process, many women find it harder to keep extra pounds off in their 40s and 50s. Often women lose muscle and gain fat, mainly in the belly area. Lifestyle factors come into play, too — menopausal women tend to be less active and eat more calories than they need.

Health Risks Associated with Menopausal Weight Gain

Let's face it: When we gain weight, we don't feel good. It can be uncomfortable and cause low self esteem. But that's not all. Weight gain is related to health issues including high cholesterol, high blood pressure and insulin resistance (a condition in which body cannot use insulin correctly, which can lead to diabetes).

Avoiding a “Midlife Metabolic Crisis”

Plan for body's natural metabolic slowdown. As with any time in life, there are no quick fixes when it comes to weight loss. There are, however, ways to avoid a midlife crisis when it comes to a slowing metabolism.

- *Be physically active.* Adults should do at least 30 minutes of moderate-intensity exercise most days of the week. Exercise doesn't have to mean a trip to the gym. You can be active doing daily activities. Take the stairs; park further away from your destination and walk; garden; or dance.
- *Eat Right.* Foods such as vegetables, fruits, whole grains, low-fat dairy products and lean protein foods contain the nutrients you need without too many calories. If you drink alcohol, limit yourself to one drink a day.
- *Avoid oversized portions.* Try using a smaller plate, bowl and glass. Cook more often at home where you are in control of what's in your food. When eating out, choose lower calorie menu options. Choose dishes that include vegetables, fruits and whole grains.

Nutrition Needs That Change During Menopause

Menopause is a major transitional time, physically and emotionally—even nutritional needs change a bit. Women at this stage still need to eat a balanced diet rich in fruits, vegetables, whole grains and healthy protein and calcium sources, but there are a few nutritional recommendation changes for women that start right around menopause.

Fewer Calories

As one gets older, muscle mass decreases and metabolism slows down, so that means one don't need as many calories as when they were younger. That's why women often gain weight during the menopausal years.

Actually, metabolism starts to slow down around the age of 40, so if one does not adjust their caloric intake down, they are probably going to gain weight. But, if one increases exercise and build muscle, one can increase daily caloric expenditure and avoid menopausal weight gain.

More Calcium

Calcium is essential for healthy bones and teeth, along with normal muscle and nerve function. Plus you need calcium for blood to clot properly. A calcium deficiency can lead to osteoporosis or osteopenia, especially when one gets older (it has to do with hormones).

Because the risk of osteoporosis goes up after menopause, women need more calcium. Younger women need about 1,000 milligrams per day, but after age 50 that goes up to 1,200 milligrams per day. Dairy foods are high in calcium, but so are leafy greens, some fish, nuts, and seeds. Calcium is also one of the most popular dietary supplements.

Less Iron

Your body needs iron to build healthy red blood cells so they can carry plenty of oxygen to all parts of your body. Your muscles need iron as well. If you don't get enough iron, you can lead to feeling weak and tired due to iron-deficiency anemia.

Most younger women need about 18 milligrams of iron each day. There's no real need to cut back on your iron intake when you go through menopause, but once you stop having menstrual periods, you only need about eight milligrams per day. Iron-rich foods include red meat, oysters, organ meat, legumes, nuts, and leafy greens. Iron is also available in supplement form.

More Vitamin D

Vitamin D is essential for absorbing and using calcium. So, it makes sense that if one needs more calcium, they also need more vitamin D. The thing about vitamin D is that one does not find in it many foods other than fortified foods like milk and cereal, salmon, egg yolks, and some mushrooms.

If you go outside and get a few minutes of sun exposure on your face and arms or legs a few days each week, your body should make enough vitamin D. Younger women who don't get enough sun exposure need about 200 International Units of vitamin D each day. That goes up to 400 IUs when you turn 50.

Most calcium supplements include vitamin D, but you can take vitamin D supplements without the calcium. But, talk to healthcare provider first.

Less Fiber

Many women don't get enough fiber at any age, and one does not need to decrease current intake, you just technically don't need as much as when you were younger.

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So, younger women need about 25 grams of fiber each day, but after the age of fifty, the recommendation drops to 21 grams of fiber.

Fiber is essential for a healthy digestive tract and eating a fiber-rich diet will help you control your cholesterol levels. Foods high in fiber include legumes (navy beans, pinto beans, soy beans, lentils, etc.), fruits, vegetables, whole grains, oatmeal, brown rice, popcorn, and nuts.

More Vitamin B-6

Vitamin B-6, or pyridoxine, is required for protein and glucose metabolism, and you need vitamin B-6 to make hemoglobin, which is the component of red blood cells that carries oxygen to all the parts of your body.

Sufficient amounts of vitamin B-6 are needed for healthy immune system function because it helps maintain the health of your thymus, spleen and lymph nodes. Vitamin B-6 is also required for normal nervous system function.

Younger women need about 1.3 milligrams per day while women over the age of 50 need about 1.5 milligrams per day. Vitamin B-6 is found in foods of both plant and animal origin, including fish, meat, fruits, legumes, and many vegetables.

As long as you eat a balanced diet, you should get plenty of vitamin B-6 and supplements aren't needed.

11.5 INFERTILITY

Infertility is a generally normal condition, significantly influencing couples therapeutically and mentally. Despite the fact that infertility treatment is protected, it very well may be time-concentrated, costly, and increment the danger of various incubations. In this manner, to decrease expenses and dangers, couples may at first consider way of life change to expand their richness and odds of pregnancy. For a considerable lot of the eating regimen factors contemplated (eg, caffeine, soy, protein, press), there are clashing information. In any case, there are a few things people devour that are negative to richness, for example, liquor and tobacco. The information on exercise are shifted however may affect ovulation and fruitfulness—positive or negative. Weight list seems to influence ripeness additionally, with stoutness in the two people contrarily influencing pregnancy rates. What's more, there remains concern and a developing assemblage of research on natural poison exposures and regenerative wellbeing. At long last, supporting patients through infertility determination and treatment is basic, as mental pressure may influence origination. It is basic that the connection between way of life variables and richness keep on being investigated in order to reduce the dismalness related with infertility.

Symptoms

For a woman, infertility (or a state of subfertility) can manifest itself as either (WHO):

- the inability to become pregnant
- an inability to maintain a pregnancy
- an inability to carry a pregnancy to a live birth

Causes

Infertility can be caused by both men and women factors. About a third of infertility problems are due to female infertility and another third are due to male infertility. In remaining cases infertility may be due to problems in both partners or the cause is unclear.

Risk factors

- (a) **Damage to fallopian tubes:** Damage to the fallopian tubes (convey the eggs from the ovaries to the uterus) can anticipate contact between the egg and sperm. Pelvic incendiary ailments (PID) caused by different contaminations, endometriosis, pelvic medical procedure may prompt harm to fallopian tubes. Explicitly transmitted contaminations (STIs) are the basic reason for PIDs.
- (b) **Disturb ovarian capacity/hormonal causes:** Synchronized hormonal changes happen amid the menstrual cycle prompting the arrival of an egg from the ovary (ovulation) and the thickening of the endometrium (inward coating of the uterus) in anticipation of the prepared egg (developing life) to embed inside the uterus. Trouble in ovulation is found in following conditions-
 - i. **Polycystic ovary syndrome(PCOS)** Polycystic ovary disorder is the regular reason for female infertility. PCOS meddles with ordinary ovulation.
 - ii. **Useful hypothalamic amenorrhea:** Excessive physical (normal in competitors) or passionate pressure may result in amenorrhoea (nonattendance of periods).
 - iii. **Decreased ovarian hold or untimely ovarian maturing:** ladies with lessened ovarian save may encounter trouble in imagining, (however blood test will indicate lifted follicular invigorating hormones).
 - iv. **Untimely ovarian deficiency:** Female ovaries quit working before she is 40 years old. The reason can be normal or it tends to be a malady, medical procedure, chemotherapy, or radiation.
- (c) **Uterine causes:** Abnormal life systems of the uterus; the nearness of polyps and fibroids may prompt infertility.

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- (d) Cervical causes: A little gathering of ladies may have a cervical condition in which the sperm can't go through the cervical channel because of irregular bodily fluid generation or an earlier cervical surgery.

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Method of detection

Both male and female factors can contribute to infertility. A detailed medical history, physical examination and investigations are needed to assess the cause of infertility.

Evaluation of infertility includes following steps:

- (a) History taking: Couples with infertility issue are met independently and together to think about vital certainties with full history taking. Full history incorporates: present history; menstrual and obstetric history (in female accomplice); prophylactic and sexual history; family and previous history.
- (b) Clinical examination: Full clinical examination of the two accomplices is required for identification of any physical issue. It incorporates general examination alongside examination of chest, bosom, stomach area, and genitalia. It serves to social insurance expert to make a temporary finding. Examinations are encouraged to demonstrate the clinical analysis and to bar other close conceivable causes.
- (c) Investigations: Infertile couples are typically encouraged to begin their examinations following a year of endeavoring to imagine or following a half year if the female accomplice is over 35 years of age or quickly if there is an undeniable reason for their infertility or subfertility.

As the real reasons for infertility are sperm variations from the norm, ovulation brokenness, and fallopian tube impediment, the fundamental examinations for the barren couple ought to be centered around:

Semen investigation: It ought to be done following 72 hours of sexual forbearance and two examination ought to be prompted with 3 months separated at the equivalent lab. (Results might be deciphered for its volume, sperm check, Botility, and morphology as indicated by the WHO reference values*).

Female accomplice

Location of ovarian capacity:

Hormonal examine (early follicular FSH and LH levels, and mid-luteal progesterone levels), Transvaginal ultrasonography is utilized for discovery of ovulation in females and any variation from the norm in uterus and adnexa (bordering anatomical parts of the uterus).

Assessment of tubal patency:

Hysterosalpingography (HSG): It is a radiological strategy. The color is infused in to the uterus through the cervix and at the same time X-Ray pictures are taken to see the development of color in to the fallopian tubes. Spilling of color into the stomach cavity demonstrates that tubes are patent.

Propelled examinations:

Hormonal measure: Thyroid capacity test, prolactin levels, testosterone, and different tests if polycystic ovary disorder is suspected.

Laparoscopy is a surgery used to envision stomach and pelvic organs (uterus, fallopian cylinders and ovaries).

Hysteroscopy is demonstrated for intrauterine space-involving injuries distinguished on HSG Chromosomal karyotyping is utilized for suspected hereditary clutters.

Male accomplice

Hormonal test: FSH, LH, Testosterone, TSH and Prolactin (for male with strange fundamental examination and suspected endocrine issue)

Testicular biopsy: A fine-needle goal biopsy to separate among obstructive and non-obstructive azoospermia.

Chromosomal karyotyping is utilized for suspected hereditary scatters.

Prevention

Embracing a more advantageous way of life through basic way of life changes may diminish the odds of infertility.

Lifestyle changes include

- (a) Weight the executives is critical in avoiding and treating infertility. Ladies who are overweight or underweight ovulate less frequently contrasted with ladies of a solid weight. So also overweight men are probably going to have diminished richness. In this way keep up a sound load with solid eating routine and exercise.
- (b) Eat a fair eating routine which ought to incorporate entire grains, beats, crisp leafy foods, low fat drain items. Constraining utilization of sugar, liquor, caffeine, no smoking including detached smoking can beneficially affect a couple's capacity to imagine.
- (c) Participating in moderate exercise can help enhance menstrual regularities and generally wellbeing, though once in a while over the top exercise can irritate menstrual cycle as observed in focused competitors rehearsing extreme instructional meetings.

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- (d) Making time for recreation and satisfaction is a sound advance to bring down feelings of anxiety and enhances physical and enthusiastic wellbeing.
- (e) Illegal medications, for example, weed or cocaine ought to be stayed away from as can influence ripeness.
- (f) Practice safe sex-Sexually transmitted contaminations (STIs, for example, chlamydia and gonorrhoea, are driving reasons for infertility. STIs can prompt blockage of fallopian cylinders, prostatitis and different issues that lessen ripeness.
- (g) Age and infertility: The choice to have a child and deciding the perfect time to begin a family is a profoundly close to home decision. In any case, ladies need to comprehend, that the organic clock is a main problem, more established the female accomplice, the more trouble a couple can confront when endeavoring to get pregnant.

Check Your Progress

4. List some of the sources of folate.
5. Who are the people at risk of vitamin D deficiency?
6. What are some of the common symptoms of menopause?
7. How does infertility manifest itself in women as per WHO?

11.6 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Moderate level of physical activity refers to a level of less than the 2 1/2 hours per week of the moderate aerobic activity.
2. The RDA for visible fat for an average woman weighing 55 kgs doing heavy work is 30g/day.
3. Buttermilk, curd, milk, green gram dhal, green leafy vegetables, ragi, barley flour and apples are considered as cold inducing foods which are actually nutritious.
4. Folate is present in a variety of vegetables and fruits, as well as legumes, nuts, yeast extracts such as Vegemite, and fortified foods such as bread and some breakfast cereals.
5. Women who have very low levels of sunlight exposure or have naturally very dark skin are at a risk of vitamin D deficiency. Those affected may

include women who cover most of their body when outdoors, shift workers, those who are unable to regularly get out of their house or women in residential care. Women who have certain medical conditions or are on some medications may also be affected.

6. Common symptoms of menopause include hot flashes, night sweats, weight gain around the middle, sleep disturbances and mood changes.
7. For a woman, infertility (or a state of subfertility) can manifest itself as either (WHO):
 - the inability to become pregnant
 - an inability to maintain a pregnancy
 - an inability to carry a pregnancy to a live birth

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11.7 SUMMARY

- Attaining a healthy lifestyle is merely a job of eating the right nutrients. Amongst other factors, physical activity has a dominant influence. The mode of activity can be defined as the level of physical exertion that a task requires. Mode of activity can be categorized into three groups:
 - o Sedentary: A sedentary activity level describes someone who gets little to no exercise
 - o Moderate: It refers to a level of less than the 2 1/2 hours per week of the moderate aerobic activity
 - o Heavy: It refers to vigorous physical activity for at least one hour and 15 minutes every week
- The type of activity will result in the body spending energies at different levels. Of course, this must be balanced with the help of right balanced diet including appropriate nutrients intake.
- The examinations of food intakes by grown-ups clarify that extraordinary exertion will be expected to both give and empower admission of more natural product, vegetables, low-fat dairy items, and entire grains while constraining introduction to and the utilization of nourishments high in sugar, strong fats, and sodium and of refined grains.
- More prominent admission of leafy foods will enhance admission of nutrient C, carotenoids (dull green and orange vegetables), folate (dim green vegetables, oranges, and vegetables), nutrient B6 (vegetables and bananas), magnesium (vegetables), potassium, and dietary fiber (most nonstarchy products of the soil).

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- Higher admissions of low-fat milk or yogurt will enhance admissions of magnesium, calcium, potassium, Vitamin B12, and, whenever braced, Vitamin D. Consideration of sustained breakfast oats will give some crystalline Vitamin B12. The incorporation of all the more entire grains will enhance admissions of nutrient B6, magnesium, and dietary fiber.
- Food habits are formed early in childhood, passed on from the elders in the family and perpetuated to adulthood. Food beliefs either encourage or discourage the consumption of particular type of foods.
- Grown-ups beyond 20 years old ought to target at least 30-45 minutes of physical movement of moderate force, (for example, energetic strolling 5-6 km/hr) 5-6 days of the week. More noteworthy medical advantages can be acquired by participating in physical movement of longer length or increasingly fiery force, for example, running, running, cycling and swimming.
- Men beyond 40 years old years, ladies beyond 50 years old years and individuals at high hazard for interminable infections like coronary illness and diabetes should initially counsel a doctor before taking part in a program of incredible physical action, for example, running and swimming.
- The interplay of hormones throughout a woman's menstrual cycle affects her body and state of mind. Energy intakes are generally higher in the premenstrual phase and some women also have food cravings as their period approaches.
- A healthy diet is important during breastfeeding because the mother must provide for her own nutrient requirements, as well as for the production of breastmilk. Particular attention needs to be paid to protein, calcium, iron, vitamins and fluids.
- Menopause is a time of many changes for women, both biologically and environmentally. As the woman approaches and enters menopause, their hormones change. The way the body processes certain nutrients changes. There is a need for more of some nutrients and less of others. The way the woman consume foods should be altered to optimize the way the body processes these nutrients.
- Infertility is a generally normal condition, significantly influencing couples therapeutically and mentally. Despite the fact that infertility treatment is protected, it very well may be time-concentrated, costly, and increment the danger of various incubations. In this manner, to decrease expenses and dangers, couples may at first consider way of life change to expand their richness and odds of pregnancy. For a considerable lot of the eating regimen factors contemplated (eg, caffeine, soy, protein, press), there are clashing information.

11.8 KEY WORDS

- **Refined foods:** It refers to foods which have been processed to improve their appearance, colour, taste, odour or keeping quality.
- **Saturated fatty acids:** It refers to the fatty acids containing maximum number of hydrogen atoms that each carbon atom can carry. They do not have double bonds.
- **Menopause:** It refers to the period in a woman's life (typically between the ages of 45 and 50) when menstruation ceases.
- **Infertility:** It refers to the inability to conceive children

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11.9 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the different categories of modes of activities?
2. Give a brief overview of balanced diet for adults as per their mode of activity (number of portions).
3. What is the recommended dietary allowance for Indian adults?
4. Write a short note on food belief and taboos in India.
5. Briefly explain the relationship between nutrition and premenstrual syndrome.
6. How does anaemia deficiency affect women?
7. What are the risk factors associated with infertility in women?

Long-Answer Questions

1. Write short notes on: (i) vitamins, minerals and pregnancy, (ii) nutrition during breastfeeding.
2. Explain the prevalence of osteoporosis in women.
3. Describe how nutrition affects the menopause phase for women.
4. Explain the evaluation of infertility.
5. Discuss, in detail, the ways to help minimize the odds of infertility in women.

11.10 FURTHER READINGS

NOTES

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed*. New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

Website

<http://ninindia.org/DietaryGuidelinesforNINwebsite.pdf>

BLOCK - IV
NUTRITION IN OLD AGE, SPECIAL EVENTS AND
NUTRITION MONITORING

Nutrition in Old Age

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UNIT 12 NUTRITION IN OLD AGE

Structure

- 12.0 Introduction
- 12.1 Objectives
- 12.2 Elderly Age Group: An Overview
- 12.3 Physiological Conditions Metabolic, Body Composition Changes in Elderly (Ageing Process)
 - 12.3.1 Socio-Psychological Factors
- 12.4 Nutritional and Health Status of Elderly
- 12.5 Answers to Check Your Progress Questions
- 12.6 Summary
- 12.7 Key Words
- 12.8 Self Assessment Questions and Exercises
- 12.9 Further Readings

12.0 INTRODUCTION

Both the number and the extent of elderly people - characterized as matured 60 and over - are developing in for all intents and purposes all nations, and overall patterns are probably going to proceed unabated. In 2002 there were an expected 605 million more old people on the planet, about 400 million of whom were living in low-salary nations. Greece and Italy had the most elevated extent of elderly people (both 24% in 2000). By 2025, the quantity of more old people worldwide is relied upon to achieve more than 1.2 billion, with around 840 million of these in low-pay nations. In this unit, you will learn about nutrition in old age.

12.1 OBJECTIVES

After going through this unit, you will be able to:

- Explain the theories of ageing
- Discuss the ageing process including the physiological, metabolic, body composition changes
- Describe the nutritional and health status of elderly

12.2 ELDERLY AGE GROUP: AN OVERVIEW

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The following points reflect the current scenario of elderly:

Ladies contain most of the elderly populace in for all intents and purposes all nations, to a great extent on the grounds that ladies live longer than men.

By 2025, both the extent and number of elderly ladies are required to take off from 107 to 373 million in Asia, and from 13 to 46 million in Africa. This example includes its very own uncommon wholesome requirements, accentuations and examples of lack of healthy nutrition, including for instance the frequency of osteoporosis in more seasoned ladies.

Huge numbers of the infections endured by elderly people are the aftereffect of dietary factors, some of which have been working since earliest stages.

These elements are then exacerbated by changes that normally happen with the maturing procedure.

Definition of elderly

People of 60 years or more (WHO) are called the elderly. In India, the elderly comprise around 7 percent of the aggregate populace (Census, 2001) and by 2016 what's more, by they are probably going to increment to 10 percent.

Theories of Aging

Many theories have been proposed to explain the process of aging. The traditional aging theories hold that aging is not an adaptation or genetically programmed. Modern biological theories of aging in humans fall into two main categories: programmed and damage or error theories. The programmed theories imply that aging follows a biological timetable, perhaps a continuation of the one that regulates childhood growth and development. This regulation would depend on changes in gene expression that affect the systems responsible for maintenance, repair and defense responses. The damage or error theories emphasize environmental assaults to living organisms that induce cumulative damage at various levels as the cause of aging.

The programmed theory has three sub-categories:

1. **Programmed longevity:** Aging is the result of a sequential switching on and off of certain genes, with senescence being defined as the time when age-associated deficits are manifested. Dr. Davidovic et al discuss the role of genetic instability in aging and dynamics of the aging process.
2. **Endocrine Theory:** Biological clocks act through hormones to control the pace of aging. Recent studies confirm that aging is hormonally regulated and that the evolutionarily conserved insulin/IGF-1 signalling (IIS) pathway plays a key role in the hormonal regulation of aging.

Dr. van Heemst discusses the potential mechanism underlying IIS and the aging process.

3. **Immunological theory:** The immune system is programmed to decline over time, which leads to an increased vulnerability to infectious disease and thus aging and death. It is well documented that the effectiveness of the immune system peaks at puberty and gradually declines thereafter with advance in age. For example, as one grows older, antibodies lose their effectiveness, and fewer new diseases can be combated effectively by the body, which causes cellular stress and eventual death. Indeed, dysregulated immune response has been linked to cardiovascular disease, inflammation, Alzheimer's disease (AD), and cancer. Although direct causal relationships have not been established for all these detrimental outcomes, the immune system has been at least indirectly implicated.
4. **The damage or error theory include:** (1) *Wear and tear theory.* Cells and tissues have vital parts that wear out resulting in aging. Like components of an aging car, parts of the body eventually wear out from repeated use, killing them and then the body. So the wear and tear theory of aging was first introduced by Dr. August Weismann, a German biologist, in 1882, it sounds perfectly reasonable to many people even today, because this is what happens to most familiar things around them. (2) *Rate of living theory.* The greater an organism's rate of oxygen basal metabolism, the shorter its life span.
5. **The rate-of-living theory of aging:** The rate-of-living theory of aging while helpful is not completely adequate in explaining the maximum life span. Dr. Rollo proposes a modified version of Pearl's rate of living theory emphasizing the hard-wired antagonism of growth (TOR) and stress resistance (FOXO).
6. **Cross-linking theory:** The cross-linking theory of aging was proposed by Johan Bjorksten in 1942. According to this theory, an accumulation of cross-linked proteins damages cells and tissues, slowing down bodily processes resulting in aging. Recent studies show that cross-linking reactions are involved in the age-related changes in the studied proteins.
7. **Free radicals theory:** This theory, which was first introduced by Dr. Gerschman in 1954, but was developed by Dr. Denham Harman proposes that superoxide and other free radicals cause damage to the macromolecular components of the cell, giving rise to accumulated damage causing cells, and eventually organs, to stop functioning. The macromolecules such as nucleic acids, lipids, sugars, and proteins are susceptible to free radical attack. Nucleic acids can get additional base or sugar group; break in a single- and double-strand manner in the backbone and cross link to other molecules. The body does possess

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some natural antioxidants in the form of enzymes, which help to curb the dangerous build-up of these free radicals, without which cellular death rates would be greatly increased, and subsequent life expectancies would decrease. This theory has been bolstered by experiments in which rodents fed antioxidants achieved greater mean longevity. However, at present, there are some experimental findings which are not agreed with this early proposal. The review by Igor Afanas'ev shows that reactive oxygen species (ROS) signalling is probably the most important enzyme/gene pathway responsible for the development of cell senescence and organismal aging and that ROS signalling might be considered as further development of free radical theory of aging.

8. **Somatic DNA damage theory.** DNA damages occur continuously in cells of living organisms. While most of these damages are repaired, some accumulate, as the DNA Polymerases and other repair mechanisms cannot correct defects as fast as they are apparently produced. In particular, there is evidence for DNA damage accumulation in non-dividing cells of mammals. Genetic mutations occur and accumulate with increasing age, causing cells to deteriorate and malfunction. In particular, damage to mitochondrial DNA might lead to mitochondrial dysfunction. Therefore, aging results from damage to the genetic integrity of the body's cells. Overall, while multiple theories of aging have been proposed, currently there is no consensus on this issue. Many of the proposed theories interact with each other in a complex way. By understanding and testing the existing and new aging theories, it may be possible to promote successful aging as well as to enhance the lifespan of mankind.

12.3 PHYSIOLOGICAL CONDITIONS METABOLIC, BODY COMPOSITION CHANGES IN ELDERLY (AGEING PROCESS)

Maturing influences every one of the frameworks of the body, and is related with a few physiological, metabolic and mental changes.

The changes include decrease in physical movement, absorption, digestion, bone mass and bulk. Coming up short visual perception and weakened hearing may likewise happen. Low craving because of loss of taste and smell discernment, dental issues, atrophic changes in GIT, clogging and diminished physical movement could prompt in general lessening of sustenance admission and poor assimilation of supplements.

Powerlessness to get ready nourishment, financial reliance what's more, other psycho-social issues unfavorably influences the wellbeing and healthful status of the elderly. Elderly people are especially powerless against lack of healthy foods. Also, endeavors to furnish them with sufficient nourishment experience numerous commonsense issues.

To start with, their wholesome prerequisites are not very much characterized. Since both fit weight and basal metabolic rate decrease with age, an elderly individual's energy prerequisite per kilogram of body weight is additionally diminished.

The way toward maturing additionally influences other supplement needs. For instance, while requirements for a few supplements might be lessened, a few information propose that necessities for other fundamental supplements may in truth ascend in later life.

There is in this way an earnest need to audit current suggested day by day supplement recompenses for this gathering.

There is additionally an expanding request worldwide for WHO rules which equipped national experts can use to address the dietary needs of their developing elderly populaces.

Degenerative illnesses, for example, cardiovascular and cerebrovascular ailment, diabetes, osteoporosis and malignant growth, which are among the most widely recognized maladies influencing more seasoned people, are all eating regimen influenced.

Progressively in the eating regimen/sickness banter, the job that micronutrients play in advancing wellbeing and counteracting noncommunicable illness is getting significant consideration.

Micronutrient inadequacies are frequently regular in elderly individuals because of various factors, for example, their decreased nourishment consumption and an absence of assortment in the foods they eat. Another factor is the cost of nourishments wealthy in micronutrients, which further debilitates their utilization. Aggravating this circumstance is the way that the elderly individuals frequently experience the ill effects of diminished resistant capacity, which adds to this current gathering's expanded horribleness and mortality.

Other noteworthy age-related changes incorporate the loss of psychological capacity and falling apart vision, all of which ruin great wellbeing and dietary propensities in seniority.

Raised serum cholesterol, a hazard factor for coronary illness in people, is normal in more older individuals and this relationship holds on into extremely seniority.

Likewise with more youthful individuals, medicate treatment ought to be viewed as simply after genuine endeavors have been made to adjust diet. Intercession preliminaries have demonstrated that decrease of pulse by 6 mm Hg lessens the danger of stroke by 40% and of heart assault by 15%, and that a 10% decrease in blood cholesterol focus will diminish the danger of coronary illness by 30%.

Dietary changes appear to influence hazard factor levels all through life and may have a considerably more prominent effect in elderly individuals. Moderately

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humble decreases in soaked fat and salt admission, which would lessen pulse and cholesterol fixations, could substantially affect diminishing the weight of cardiovascular infection. Expanding utilization of foods grown from the ground by one to two servings day by day could cut cardiovascular hazard by 30%.

Body organization changes with increasing age, and these progressions influence wholesome requirements of the elderly. Elderly or matured individuals require lessened measures of calories, as their lean bulk and physical movement diminish with maturing. Elderly are more inclined to infections because of brought down nourishment consumption, physical action what's more, protection from disease. Great/solid sustenance propensities and standard agreeable dimension of physical movement are required to limit the evil impacts of maturing and to enhance the personal satisfaction.

Elderly need satisfactory measures of protein, sugars, fat, nutrients, minerals and dietary fiber. Elderly need more calcium, press, zinc, vitamin A and cell reinforcements to forestall age-related degenerative sicknesses and for sound maturing.

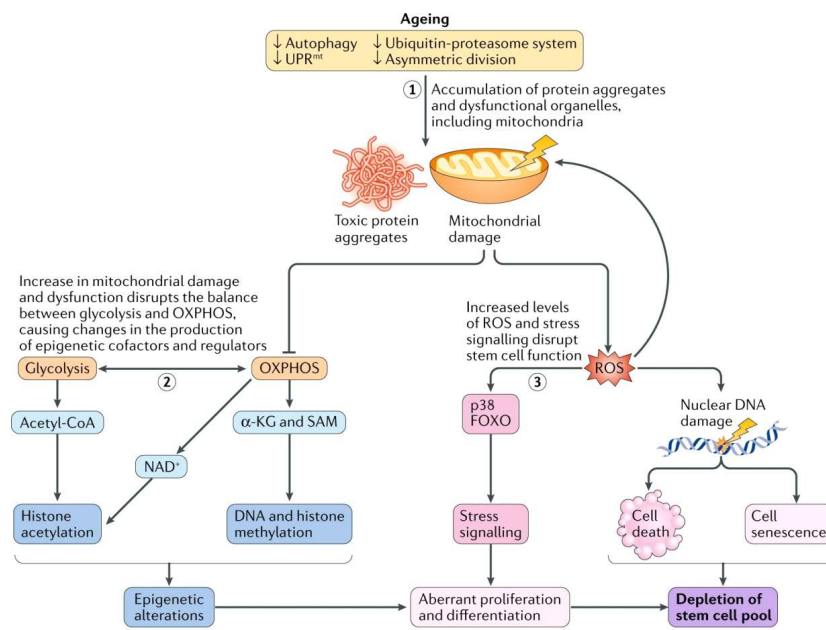


Fig. 12.1 Ageing and the Bodily Changes

Diseases associated with elderly

There is a decrease in insusceptible capacity with propelling age, which prompts diminished protection from irresistible maladies. The expanded parathyroidhormone (PTH) emission in the elderly prompts expanded bone turn over i.e. osteoporosis. Essentially, elderly people are at expanded danger of osteomalacia i.e. damaged bone mineralization because of absence of presentation to daylight and terrible eating routine less than stellar eating routine. By and large, huge expenditure on

health and nutrition is one of the most important issues among the elderly. Utilization of nutritious nourishments wealthy in micronutrients including cancer prevention agent nutrients and minerals and fiber, agreeable dimension of physical movement would empower the elderly to live dynamic and significant sound lives, without being a weight on society and their relatives. Uncomplicated maturing can likewise be very gainful, say in the household circle. Protection from illness decreases in the elderly. The normal afflictions in the elderly are degenerative sicknesses, for example, joint pain (joint infections), osteoporosis, osteomalacia, waterfall, diabetes, cardiovascular (stroke, heart sicknesses) issues, neurological (Parkinson's, Alzheimer's) and mental (dementia, despondency, insanity) issue and malignant growth. Other than these, the predominance of respiratory, gastro intestinal tract (GIT) and urinary tract contaminations is common among the elderly.

Osteoporosis and related cracks are a noteworthy reason for sickness, handicap and demise, and are an immense restorative cost. It is assessed that the yearly number of hip breaks worldwide will ascend from 1.7 million out of 1990 to around 6.3 million by 2050. Ladies endure 80% of hip breaks; their lifetime chance for osteoporotic cracks is in any event 30%, and presumably closer to 40%. Conversely, the hazard is 13% for men.

Ladies are at more serious hazard on the grounds that their bone misfortune quickens after menopause. Avoidance is conceivable with hormone treatment at menopause. Way of life factors – particularly diet, yet in addition physical movement and smoking – are additionally connected with osteoporosis, which opens the path for essential anticipation. The fundamental point is to counteract breaks; this can be accomplished by expanding bone mass at development, by averting consequent bone misfortune, or by reestablishing bone mineral. Especially imperative are satisfactory calcium consumption and physical action, particularly in pre-adulthood and youthful adulthood.

12.3.1 Socio-Psychological Factors

Loneliness and social isolation powerfully affect food intake. Older people living alone often have little desire to prepare meals and may eat only those foods that are conveniently available. There are some who eat compulsively to assuage their feeling of loneliness, depression and despair.

Food misinformation and faddism

Various elderly people have variety of erroneous beliefs about foods that are normal constituents of diet. e.g. older people don't need milk. It causes flatulence and constipation. Fruits are too acidic. Honey and vinegar reduce the symptoms of arthritis etc.

Faddism on the other hand refers to a fashion that is taken up with great enthusiasm for a brief period of time. For instance, Atkin's diet and paleo diet.

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Diet and feeding pattern

With the advancement of age, the energy needs are reduced and as a result the total quantum of food intake is lowered while the requirement of most of the other nutrients remain unaltered. Therefore, it becomes all the more important to provide adequate amounts of all the nutrients within the decreased energy levels.

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- (a) Special emphasis to be given on food sources of calcium, vitamin B6, Magnesium, Zinc and Iron.

Iron, *Bajra*, soyabean and its products (especially for elderly woman), roasted *chana*, amaranth, mustard leaves, almonds, garden cress seeds, raisins. Vitamin B6 Whole wheat, jowar Magnesium, jowar, pink raddish, moth beans, soyabean, almond, walnut, garden cress seeds, green chillies, ginger (fresh), ripe mango. Zinc, Gingelly seeds, almond, *rajmah*, *chana*. Calcium, Skim milk, lowfat milk, yogurt, bajra, amaranth leaves, fenugreek leaves, lotus stem, *til* seeds.

- (b) Breakfast is often the best meal of the day and it should be planned to contribute a significant proportion of the day's nutrient.

- (c) A serving of fruit or salad and a glass of butter milk/milk/soup/herbal tea/coconut water/lime water or any other liquid should be included with meals, to aid in digestion as there is muscle weakness, decreased secretion of saliva, reduced acid secretions leading to delayed oesophageal emptying and constipation.

- (d) As lactose intolerance develops in old age, therefore milk substitutes like yogurt, butter milk, curd, paneer, low fat cheese, tofu etc. should be preferred over milk and should be given to provide for calcium.

- (e) A soluble fibre-rich diet to be given as helps to prevent constipation, flatulence and also can be easily chewed, e.g. Oats, muesli, *dalia*, puffed wheat flakes, steamed sprouts, GLV esp. *bathua*, *chulai*, spinach etc.

- (f) Consume a variety of fresh fruits and vegetables (rich in phytonutrients) helpful in overcoming diseases.

- Apricots, Carrots, Squash, Papaya - Rich in (3 carotene)
- Peppers, Kiwi, Oranges, Guava, *Amla* - Rich in vitamin C
- Raw nuts, Seeds, Walnuts, Almond, Cold pressed vegetable oils, *Til* seeds - Rich in vitamin E
- Onion, Broccoli, Tuna, Garlic - Rich in Selenium

- (g) Small and frequent meals instead of three heavy meals favor more complete digestion and free from distress.

- (h) Use alternative methods of cooking requiring less of fat, i.e. steaming, boiling, braising, baking, sautéing.

- (i) Spice up the food by adding herbs like basil, thyme, oregano, rosemary, mint leaves, tamarind, tomato, coriander leaves, green chili and spices like cumin seeds and powder, ginger, cinnamon, coriander, turmeric rather than salt, to overcome reduced taste and smell sensitivity in old age.
- (j) Food rich in fats, especially saturated fats, should be avoided and instead oils containing high levels of poly unsaturated fatty acids (omega 3) such as olive oil, flaxseed oil, sunflower oils, soyabean oil etc. should be used to prevent and control the condition of hypertension and other cardiovascular diseases.
- (k) Due to loss of teeth particularly if dentures are not used, modifications in consistency need to be made. The diet should be soft, well cooked and should include foods that need little or no mastication such as milk and milk products, soft cooked eggs, tender meats, gruels, soft cooked vegetables, grated salads, fruit juices, soft fruits like papaya or stewed fruits.
- (l) The food for the elderly should be presentable in appearance and tasty and should be served in pleasant surroundings so as to arouse their appetite and interest in the food.

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12.4 NUTRITIONAL AND HEALTH STATUS OF ELDERLY

The following points reflect the gist of nutritional and health status of the elderly:

- As individuals develop into elders, they will in general turn out to be physiologically less dynamic and, in this manner, require less calories to keep up their weights. The day by day admission of oil ought to not surpass 20 g.
- Utilization of ghee, margarine, vanaspati and coconut oil ought to be maintained a strategic distance from.
- They require provisions rich in protein, for example, beats, conditioned drain, egg-white and so forth.
- The elderly populace is inclined to different nourishing inadequacies. In this way, the elderly requires supplement rich sustenance wealthy in calcium, miniaturized scale supplements and fiber.
- Aside from grains what's more, they require every day no less than 200-300 ml of milk and milk items and 400 g of vegetables and natural products to give fiber, small scale supplements and cell reinforcements.
- Incorporation of these things in the eating routine enhances the nature of the eating regimen and gut work.
- Substance food and eggs add to the nature of eating routine.

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- The eating routine should be all around cooked, delicate and less salty and fiery. Little amounts of nourishment ought to be devoured at more regular interims and satisfactory water ought to be expended to maintain a strategic distance from drying out, hyponatraemia and obstruction.
- Iodine is required for functioning of thyroid hormones.
- Thyroid hormones are important for development and improvement.
- Iodine inadequacy prompts goiter (broadening of thyroid organ)
- Absence of iodine in the water and diet is the primary driver of iodine insufficiency issue.
- Iodine insufficiency amid pregnancy results in still births, premature births and cretinism.
- Utilization of iodized salt guarantees sufficient iodine consumption.
- Exercise is an indispensable piece of keeping up solid life. It manages body weight. The danger of degenerative maladies is impressively diminished by customary work out. Exercise timetable ought to be chosen in conference with a doctor.
- Dietary fat is by all accounts related with malignant growth of the colon, pancreas and prostate. Atherogenic chance factors, for example, expanded pulse, blood lipids and glucose prejudice, which are all altogether influenced by dietary variables, assume a noteworthy job in the advancement of coronary illness.



Fig. 12.2 Considerations for Maintaining Elderly Nutrition

Conclusion

The cornerstone of geriatric vitamin is a well-balanced diet. This gives optimum vitamin to help prolong the main reasons of death: coronary heart disease, most

cancers, and stroke. In addition, ongoing research suggests that dietary habits, such as restricting one's calorie consumption and consuming antioxidants, may additionally increase longevity. Various changes may happen in the maturing individual's social and mental status, possibly influencing craving and nourishment status. These include:

Wretchedness, the most widely recognized reason for unexplained weight reduction in more seasoned grown-ups, happens in roughly 15% of grown-ups over age 65, with a lot higher occurrence in those living in broadened care offices.

Memory impedance caused by different sorts of dementia, Alzheimer's illness, or other neurological sicknesses rises significantly, with half of all people over age 85 influenced. Weight reduction and inappropriate nourishment are potential issues.

Liquor misuse is frequently unreported, particularly since around 33% of drunkards age 65 years or more seasoned start drinking further down the road. Exorbitant liquor consumption (over 15% of aggregate calories) builds dreariness and mortality, and prompts both physical and psychosocial issues.

Social disconnection turns out to be more typical due to declining pay, medical issues, loss of companion or companions, and help needs. These may influence hunger and potentially wholesome status.

Check Your Progress

1. Who introduced the theory of aging?
2. List some of the degenerative afflictions in the elderly.
3. Mention the dietary sources of iron.

12.5 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. The wear and tear theory of aging was first introduced by Dr. August Weismann.
2. Examples of degenerative sicknesses, in the elderly include joint pain (joint infections), osteoporosis, osteomalacia, waterfall, diabetes, cardiovascular (stroke, heart sicknesses) issues, neurological (Parkinson's, Alzheimer's) and mental (dementia, despondency, insanity) issue and malignant growth.
3. Some dietary sources of iron include *Bajra*, soyabean and its products (especially for elderly woman), roasted *chana*, amaranth, mustard leaves, almonds, garden cress seeds, raisins, etc.

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12.6 SUMMARY

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- Both the number and the extent of elderly people - characterized as matured 60 and over - are developing in for all intents and purposes all nations, and overall patterns are probably going to proceed unabated. In 2002 there were an expected 605 million more old people on the planet, about 400 million of whom were living in low-salary nations. Greece and Italy had the most elevated extent of elderly people (both 24% in 2000). By 2025, the quantity of more old people worldwide is relied upon to achieve more than 1.2 billion, with around 840 million of these in low-pay nations.
- Ladies contain most of the elderly populace in for all intents and purposes all nations, to a great extent on the grounds that ladies live longer than men.
- Huge numbers of the infections endured by elderly people are the aftereffect of dietary factors, some of which have been working since earliest stages.
- People of 60 years or more (WHO) establish the elderly. In India, the elderly comprise around 7 percent of the aggregate populace (Census, 2001) and by 2016 what's more, by they are probably going to increment to 10 percent.
- Many theories have been proposed to explain the process of aging. The traditional aging theories hold that aging is not an adaptation or genetically programmed. Modern biological theories of aging in humans fall into two main categories: programmed and damage or error theories. The programmed theories imply that aging follows a biological timetable, perhaps a continuation of the one that regulates childhood growth and development. This regulation would depend on changes in gene expression that affect the systems responsible for maintenance, repair and defense responses. The damage or error theories emphasize environmental assaults to living organisms that induce cumulative damage at various levels as the cause of aging.
- Physiological changes in elderly include decrease in physical movement, absorption, digestion, bone mass and bulk. Coming up short visual perception and weakened hearing may likewise happen. Low craving because of loss of taste and smell discernment, dental issues, atrophic changes in GIT, clogging and diminished physical movement could prompt in general lessening of sustenance admission and poor assimilation of supplements.
- Powerlessness to get ready nourishment, financial reliance what's more, other psycho-social issues unfavorably influences the wellbeing and healthful status of the elderly. Elderly people are especially powerless against lack of healthy foods. Also, endeavors to furnish them with sufficient nourishment experience numerous common sense issues.

- Micronutrient inadequacies are frequently regular in elderly individuals because of various factors, for example, their decreased nourishment consumption and an absence of assortment in the foods they eat. Another factor is the cost of nourishments wealthy in micronutrients, which further debilitates their utilization. Aggravating this circumstance is the way that the elderly individuals frequently experience the ill effects of diminished resistant capacity, which adds to this current gathering's expanded horribleness and mortality.
- Body organization changes with increasing age, and these progressions influence wholesome requirements of the elderly. Elderly or matured individuals require lessened measures of calories, as their lean bulk and physical movement diminish with maturing. Elderly are more inclined to infections because of brought down nourishment consumption, physical action what's more, protection from disease. Great/solid sustenance propensities and standard agreeable dimension of physical movement are required to limit the evil impacts of maturing and to enhance the personal satisfaction.
- Osteoporosis and related cracks are a noteworthy reason for sickness, handicap and demise, and are an immense restorative cost. It is assessed that the yearly number of hip breaks worldwide will ascend from 1.7 million out of 1990 to around 6.3 million by 2050. Ladies endure 80% of hip breaks; their lifetime chance for osteoporotic cracks is in any event 30%, and presumably closer to 40%. Conversely, the hazard is 13% for men.
- Loneliness and social isolation powerfully affect food intake. Older people living alone often have little desire to prepare meals and may eat only those foods that are conveniently available. There are some who eat compulsively to assuage their feeling of loneliness, depression and despair.

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12.7 KEY WORDS

- **Geriatric nutrition:** It applies nutrition principles to holdup effects of aging and disease, to assist in the management of the physical, psychological, and psychosocial changes generally associated with growing old.
- **Stroke:** It is a popular term for cerebro-vascular disease, a sudden condition that arises from blocking or bleeding of blood vessels in the brain, resulting in paralysis.
- **Thrombosis:** It refers to the condition in which the blood changes from a liquid to a semi-solid state and produces a blood clot (thrombus) which blocks blood flow.

12.8 SELF ASSESSMENT QUESTIONS AND EXERCISES

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Short-Answer Questions

1. Write a short note on diseases associated with elderly.
2. Briefly explain the socio-psychological factors related to ageing.
3. Write a short note on the diet and feeding pattern for elderly.

Long-Answer Questions

1. Describe the theories of aging.
2. Explain the physiological conditions metabolic, body composition changes in elderly.
3. Discuss the nutritional and health status of elderly.

12.9 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed*. New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 13 NUTRITION IN SPECIAL CASES

NOTES

Structure

- 13.0 Introduction
- 13.1 Objectives
- 13.2 Sports Nutrition
- 13.3 Space Nutrition
- 13.4 Answers to Check Your Progress Questions
- 13.5 Summary
- 13.6 Key Words
- 13.7 Self Assessment Questions and Exercises
- 13.8 Further Readings

13.0 INTRODUCTION

In this unit, you will study nutrition for special cases. This will specifically include sports nutrition and space nutrition.

Sports nutrition is the examination and routine with regards to nourishment and diet concerning enhancing anybody's athletic execution. Nourishment is a vital piece of numerous games preparing regimens, being well known in quality games, (for example, weightlifting and working out) and continuance sports (e.g. cycling, running, swimming, paddling). Sports Nutrition concentrates its examinations on the sort, and also the amount of liquids and nourishment taken by a competitor. Furthermore, it manages the utilization of supplements, for example, nutrients, minerals, enhancements and natural substances that incorporate sugars, proteins and fats.

Space food are the kinds of food the astronauts eat, they are not mysterious concoctions but foods prepared here on Earth, with many commercially available on grocery store shelves. Diets are designed to supply each crew member with all the recommended dietary allowances of vitamins and minerals necessary to perform in the environment of space. In this unit, you will learn about the concepts of sports nutrition and space nutrition.

13.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss sports nutrition
- Explain the quantity of fluids and food taken by an athlete

- Describe the concept of space nutrition
- List food product created and processed for consumption by astronauts in outer space

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13.2 SPORTS NUTRITION

Varying conditions and targets propose the requirement for competitors to guarantee that their games wholesome methodology is fitting for their circumstance. Elements that may influence a competitor's wholesome needs incorporate sort of movement (vigorous versus anaerobic), sex, weight, stature, weight list, exercise or movement arrange (pre-exercise, introduction exercise, recuperation), and time of day (e.g. a few supplements are used by the body more viably amid rest than while awake). Most guilty parties that hinder execution are weariness, damage and soreness. A legitimate eating regimen will diminish these aggravations in execution. The way to a legitimate eating regimen is to get an assortment of sustenance, and to expend all the large scale supplements, nutrients, and minerals required. As per Eblere's article (2008), it is perfect to pick crude foods, for instance natural nourishments, for example, oranges rather than squeezed orange.

The discipline of sports diet is a dynamic one. Core capabilities in exercising physiology, psychology, integrated metabolism and biochemistry are the initial parameters for a successful career in sports nutrition. In addition to the educational fundamentals, it is quintessential that the sports nutritionist apprehends the sport in which our patron participates.

This activity specific appreciation occur itself in fuel utilization, mechanics of movement, as properly as psychological processes that motivate the participant to function optimally. Sports diet as a discipline has grown notably over the previous 50 years, from glycogen loading to modern day scientifically validated ergogenic aids.

The last ten years has considered the biggest advancement of sports activities nutrition, with the following areas riding a whole lot of the research: the consequences of exercise on protein utilization, meal timing to maximize the anabolic response, the doable for ribose to advantage those engaged in high-energy repetitive sports, and creatine and its makes use of within athletics and medicine.

The future of sports vitamin will dictate that we: 1) collectively try for a higher trendy of care and education for counseling athletes and 2) integrate exclusive disciplines. We are in an era of unheard-of increase and the new understanding is continuously evolving. The field of diet is a dynamic one.

Athletes regularly ask their trainers, physiologists, coaches, doctors, and dietitians for instruction related to what to eat and which supplements to use.

Registered dietitians have alternatives to work inside scientific dietetics, diet support, research, outpatient or non-public counseling, consulting to the food

industry, consulting to the supplement industry, direct food or supplement enterprise employment, in product improvement and many other low in cost really helpful areas.

Exercise physiologists can work in cardiac rehabilitation settings, personal health clubs, educational institutions, research organizations, for various personal businesses (corporate wellness, exercise gear design, etc.) and different associated positions. Often the weekend athlete and the professional athlete will seek vitamin advice from each the dietitian and exercising physiologist. This advice is sports nutrition.

Sports vitamin is a complicated field, and a good sports nutritionist has core skills in nutrient metabolism (biochemistry and metabolism), exercising physiology, and psychology. The traditional gaining knowledge of model has taught fundamentals of anaerobic and aerobic metabolism, but not a whole lot emphasis on sport unique strength expenditure, nor the effect of post-exercise oxygen consumption (EPOC).

Energy metabolism in sports person (study carried out by NIN, Hyderabad-2000)

The energy needs of different game exercises rely upon a few factors, for example, age, sex, body size and arrangement, atmosphere, dimension of wellness, aside from kind of game and period of preparing, force and span.

So as to keep up attractive body weight, creation what's more, crest execution levels, satisfactory nourishment should be given.

Sound nourishment shapes the establishment of games execution and any unevenness between vitality consumption and admission disables the execution. Along these lines, this examination was conveyed out to recognize the appearances of steady preparing burden on physical make-up, physiological vitality instruments and vitality necessities in three gatherings of competitors from Transition Phase (TP) to Competition Phase (CP) of preparing.

To accomplish this target, national dimension male sprinters (n=12), center separation runners (n=14) and long-remove sprinters (n=16), matured somewhere in the range of 18 and 22 years were enrolled from Sports Authority of Andhra Pradesh (SAAP), Hyderabad.

The anthropometric estimations were recorded utilizing standard techniques. The Lean Body Mass (LBM) and Fat Mass were gotten from skinfold thickness estimations utilizing age and sex coordinated conditions of Durmin and Womersley (1974).

The Basal Metabolic Rate (BMR), energy cost of different exercises and at various heaps of Graded Exercise Tests (GXT) were estimated by open circuit roundabout calorimetry. Bruce convention of GXT was embraced to assess physiological effectiveness and maximal work execution. Evaluation of preparing and vitality use was finished by 24-hours Time Allocation Pattern (TAP) joined

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with oxygen utilization levels and pulses. A similar convention was given in 3 phases. The following conclusions were drawn:

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1. There was a bigger between individual variety in preparing power gotten by the athletes in a given preparing plan. In this context, it is smarter to develop individualized dynamic program of preparing considering the competitors body weight, LBM and introductory wellness levels to give ideal/peak load to all competitors to accomplish ideal work execution.
2. The energy necessities were essentially affected by variety in preparing load. In this way, periodical assessment of vitality needs is important to prescribe vitality stipends to screen alluring weight, organization and pinnacle execution levels.
3. Despite the fact that all the physical and physiological parameters enhanced with steady preparing load, these competitors are standard beneath the global models. Consequently, it is basic to choose the competitors dependent on logical assessment with better build, invested with inborn physiological effectiveness and sustain them with legitimate logical preparing and satisfactory healthful contributions to accomplish abnormal state of athletic execution in years to come.

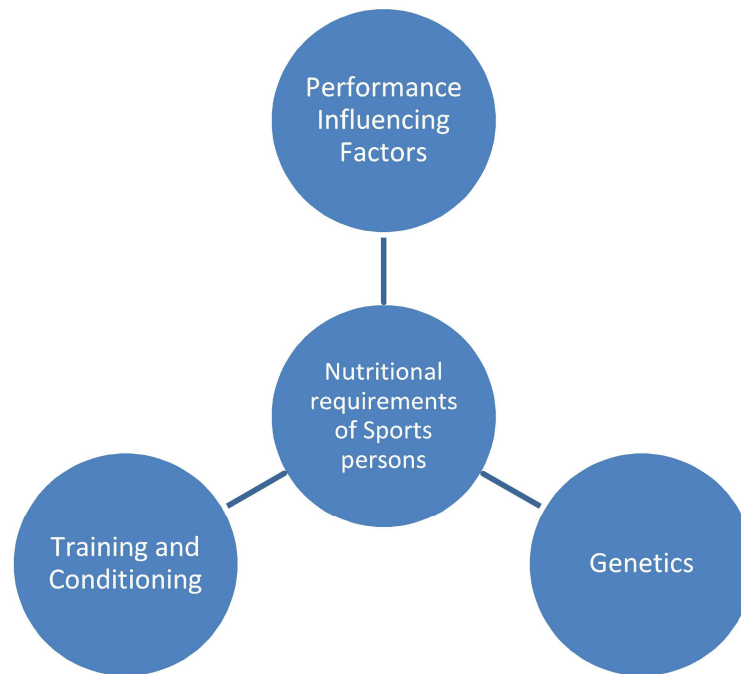


Fig. 13.1 Aspects of Nutritional Requirements of Sports Persons

Quantity of Fluids and Food taken by an Athlete

This can be understood through the following tables and figures:

During intense exercise Carbohydrate stored in muscles and liver (glycogen) is predominant fuel source

During prolonged exercise Fat stores are predominant fuel source

Well trained endurance athletes burn fat more efficiently, sparing limited glycogen stores

Carbohydrates

- Major fuel source for exercising muscle
- Athletes should ingest 6 to 10 gm/kg/day 60 to 70% of total calories should come from carbohydrates
- Complex carbohydrates (starches) are preferable
- During exercise
- Athletes should consume 25 to 30 gm of carbohydrate for every 30 minutes of exercise
- Athletes should drink 6 to 8 ounces of water or sports drink for every 10 to 15 minutes of exercise
- Carbohydrates After exercise Athletes should consume 1.0 to 1.5 gm/kg immediately post exercise and again one hour later
- To replace muscle glycogen stores
- To prevent gradual depletion of muscle glycogen stores over time caused by repetitive daily bouts of heavy exercise
- To decrease muscle breakdown
- Role of Complex Carbohydrates
- Compared to ingesting simple carbohydrates, ingesting complex carbohydrates:
 - Increases muscle glycogen stores better Improves performance and delays fatigue
 - Promotes faster stomach emptying
 - Causes less stomach upset and indigestion
 - Leads to lower blood sugar and insulin levels
 - Provides other beneficial nutrients like Fiber, vitamins and minerals
- Pre-exercise Meal
- Importance
 - Less hunger before and during exercise
 - Maintains optimum glycogen stores
- Recommendations
 - Emphasize complex carbohydrates (starches) • 1 to 4 gm/kg about 1 to 4 hours prior to event and Consume less closer to event
 - Avoid high fat and high protein foods as they cause Slower gastric emptying can cause stomach upset
 - Avoid high fiber or gas forming foods as they Can lead to crampy abdominal pain

Protein

- Athletes require more protein than non-athletes
- 12 to 18% of total calories should come from protein
- Protein intake should be tailored to type of training
- About 1.2 to 1.4 gm/kg/day recommended for endurance athletes
- 1.7 to 1.8 gm/kg/day recommended for strength athletes
- Adequate calorie intake is just as important as adequate protein intake for building muscles
- Too much protein intake can be bad Excess protein calories are stored as fat Excess protein intake can lead to dehydration and may contribute to kidney problems

Fat

- Major source of energy 25 to 30% of total calories should come from fat Less than 10% of total calories should come from saturated fats
- Cholesterol intake should be less than 300 mg/day Average American diet provides 37% of total calories from fat

Vitamins and Minerals

- Essential nutrients Human body needs these to produce energy
- No evidence in U.S. studies that taking vitamin and mineral supplements improves athletic performance Vegetarian athletes are at risk for being deficient in vitamins B12, D, riboflavin, iron, zinc and calcium Athletes who are strict vegetarians should take a multivitamin to prevent deficiencies and a calcium supplement (1000 mg/day) to help prevent bone loss

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Fig. 13.2 Nutrition Determinants of the Athlete's Energy Requirements

Table 13.1 Energy Allowance Recommendations for Different Categories of Sports

Type of Activity	Average Body Weight	Kcal/Day
POWER EVENTS OF SUPER HEAVY WT	100+	7000
POWER EVENTS OF HIGHER WT CAT	80-90	6000
ENDURANCE EVENTS	65	5200
TEAM EVENTS AND POWER EVENTS OF MIDDLE WT	65	4500
EVENTS OF LIGHT WEIGHT	60	3600
SKILL GAMES	60	3000

Conclusion

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There is a need for advanced schooling whether it is in the shape of continuing education; a reputable advanced degree certification. Sports diet is regularly viewed inside the subject to have divergent concept leaders. We know that in view that the science is evolving and that not all hold up-to-date with the modern-day publications that no longer all of us are on the same advising page. Perhaps, controversy is good. If we all had been of the identical opinion, then what would be the motivation for development and the pursuit of new knowledge? Take for example, the heated arguments that manifest just over the protein desires of athletes as compared to sedentary people as well as anaerobic versus cardio athletes. This in and of itself drives the income of many books and magazines. However, one needs to be cognizant that athletes regularly view food as one skill of acquiring their goals, while ergogenic aids at times are believed to be the missing link which will propel the athlete's performance over the competition.

13.3 SPACE NUTRITION

Foods flown in space are researched and developed in the Foods Systems Engineering Facility at NASA Johnson Space Center in Houston, Texas. Foods are tested for nutritional value, how well they freeze dry, the storage and packaging process, and of course taste. Astronauts are asked to taste test food items. They use a simple form to rate the products on such things as appearance, color, odor, flavour, and texture. These components are rated using a numbering system. The Food Systems Engineering Facility uses the astronauts ratings to help design better space food.

Astronauts select their menu about 5 months before they fly. For the ISS, they will choose 30-day flight menus. Crew members will store the food in the galley onboard the Station.

The astronauts will use a special tray on the ISS to hold their food during preparation and eating. Because everything drifts in a microgravity environment, utensils and food containers need to be held in place. Food trays will be designed on the basis of the food packages that will be used on the ISS. These trays will be different from those used on the Space Shuttle because the ISS will have a table available; the Space Shuttle does not. The ISS tray will attach to the table.

From the beginning of human space travel, food has been an important feature that has involved astronauts, technicians, and engineers. Because food is an important part of life, it is imperative that the space food system is the best it can be. Astronauts on the ISS cannot get into a car and go down to the local grocery store if they do not like what is for dinner. The supply of food must be nourishing and tasty so astronauts maintain their health during their important stays in space.

The Food Systems Engineering Facility consists of several areas: Kitchen (shown), Freeze Drying Room, Packaging Room, Analytical Laboratory, and Packaging, Fabrication, and Tasting Area.

Food Product Created and Processed for Consumption by Astronauts in Outer Space

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There are eight categories of space food:

- **Rehydratable Food:** The water is removed from rehydratable foods to make them easier to store. This process of dehydration (also known as freeze drying) is described in the earlier Gemini section. Water is replaced in the foods before they are eaten. Rehydratable items include beverages as well as food items. Hot cereal such as oatmeal is a rehydratable food.
- **Thermostabilized Food:** Thermostabilized foods are heat processed so they can be stored at room temperature. Most of the fruits and fish (tuna fish) are thermostabilized in cans. The cans open with easy-open pull tabs similar to fruit cups that can be purchased in the local grocery store. Puddings are packaged in plastic cups.
- **Intermediate Moisture Food:** Intermediate moisture foods are preserved by taking some water out of the product while leaving enough in to maintain the soft texture. This way, it can be eaten without any preparation. These foods include dried peaches, pears, apricots, and beef jerky.
- **Natural Form Food:** These foods are ready to eat and are packaged in flexible pouches. Examples include nuts, granola bars, and cookies.
- **Irradiated Food:** Beef steak and smoked turkey are the only irradiated products being used at this time. These products are cooked and packaged in flexible foil pouches and sterilized by ionizing radiation so they can be kept at room temperature. Other irradiated products are being developed for the ISS.
- **Frozen Food:** These foods are quick frozen to prevent a buildup of large ice crystals. This maintains the original texture of the food and helps it taste fresh. Examples include quiches, casseroles, and chicken pot pie.
- **Fresh Food:** These foods are neither processed nor artificially preserved. Examples include apples and bananas.
- **Refrigerated Food:** These foods require cold or cool temperatures to prevent spoilage. Examples include cream cheese and sour cream.

Microgravity

Food and how it is eaten and packaged have been greatly affected by the unique microgravity environment of space. A microgravity environment is one in which gravity's effects are greatly reduced. Microgravity occurs when a spacecraft orbits Earth. The spacecraft and all its contents are in a state of free-fall. This is why a

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handful of candy seems to float through the Space Shuttle when it is released. The candy does not drop to the floor of the Shuttle because the floor is falling, too. Because of this phenomenon, foods are packaged and served to prevent food from moving about the Space Shuttle or ISS. Crumbs and liquids could damage equipment or be inhaled. Many of the foods are packaged with liquids. Liquids hold foods together and, freed from containers, cling to themselves in large drops because of cohesion. It is similar to a drop of water on a piece of wax paper. The only difference is that this drop of water is moving about the microgravity environment of the Space Shuttle. Special straws are used for drinking the liquids. They have clamps that can be closed to prevent the liquids from creeping out by the processes of capillary action and surface tension when not being consumed. Microgravity also causes the utensils used for dining to float away. The knife, fork, spoon, and scissors are secured to magnets on the food tray when they are not being used. The effects of microgravity have had an enormous impact on the development of space food packaging, food selection, and related food system requirements.

Check Your Progress

1. What are the initial parameters for a successful career in sports nutrition?
2. Give examples of rehydratable items in space foods.
3. What are natural form foods?

13.4 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Core capabilities in exercising physiology, psychology, integrated metabolism and biochemistry are the initial parameters for a successful career in sports nutrition.
 2. Rehydratable items include beverages as well as food items. Hot cereal such as oatmeal is a rehydratable food.
 3. Natural forms foods are foods which are ready to eat and are packaged in flexible pouches.
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13.5 SUMMARY

- Sports nutrition is the examination and routine with regards to nourishment and diet concerning enhancing anybody's athletic execution. Nourishment is a vital piece of numerous games preparing regimens, being well known in quality games, (for example, weightlifting and working out) and continuance sports (e.g. cycling, running, swimming, paddling).

- Sports Nutrition concentrates its examinations on the sort, and also the amount of liquids and nourishment taken by a competitor. Furthermore, it manages the utilization of supplements, for example, nutrients, minerals, enhancements and natural substances that incorporate sugars, proteins and fats.
- Varying conditions and targets propose the requirement for competitors to guarantee that their games wholesome methodology is fitting for their circumstance. Elements that may influence a competitor's wholesome needs incorporate sort of movement (vigorous versus anaerobic), sex, weight, stature, weight list, exercise or movement arrange (pre-exercise, introduction exercise, recuperation), and time of day (e.g. a few supplements are used by the body more viably amid rest than while awake). Most guilty parties that hinder execution are weariness, damage and soreness.
- The discipline of sports diet is a dynamic one. Core capabilities in exercising physiology, psychology, integrated metabolism and biochemistry are the initial parameters for a successful career in sports nutrition. In addition to the educational fundamentals, it is quintessential that the sports nutritionist apprehends the sport in which our patron participates.
- The last ten years has considered the biggest advancement of sports activities nutrition, with the following areas riding a whole lot of the research: the consequences of exercise on protein utilization, meal timing to maximize the anabolic response, the doable for ribose to advantage those engaged in high-energy repetitive sports, and creatine and its makes use of within athletics and medicine.
- From the beginning of human space travel, food has been an important feature that has involved astronauts, technicians, and engineers. Because food is an important part of life, it is imperative that the space food system is the best it can be. Astronauts on the ISS cannot get into a car and go down to the local grocery store if they do not like what is for dinner. The supply of food must be nourishing and tasty so astronauts maintain their health during their important stays in space.
- There are eight categories of space food: Rehydratable Food, Thermostabilized Food, Intermediate Moisture Food, Natural Form Food, Irradiated Food, Frozen Food, Fresh Food and Refrigerated Food.
- Food and how it is eaten and packaged have been greatly affected by the unique microgravity environment of space. A microgravity environment is one in which gravity's effects are greatly reduced. Microgravity occurs when a spacecraft orbits Earth. The spacecraft and all its contents are in a state of free-fall. This is why a handful of candy seems to float through the Space Shuttle when it is released. The candy does not drop to the floor of the Shuttle because the floor is falling, too. Because of this phenomenon, foods are packaged and served to prevent food from moving about the Space Shuttle or ISS.

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13.6 KEY WORDS

- **Sports nutrition:** It is the examination and routine with regards to nourishment and diet concerning enhancing anybody's athletic execution.
 - **Microgravity environment:** It is one in which gravity's effects are greatly reduced. Microgravity occurs when a spacecraft orbits Earth.
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13.7 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What do you understand by sports nutrition?
2. Write a short note on food in microgravity.

Long-Answer Questions

1. What are the nutritional requirements of a sports person?
 2. Explain the types of food consumed by astronauts in space.
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13.8 FURTHER READINGS

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed.* New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

UNIT 14 NUTRITION MONITORING AND ITS CURRENT PROGRAMMES

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Structure

- 14.0 Introduction
- 14.1 Objectives
- 14.2 An Overview of Nutritional Status in India
 - 14.2.1 Nutrition Surveillance
- 14.3 Supplementary Feeding Programmes
- 14.4 Nutrient Deficiency Control Programmes
- 14.5 School Health Programme
- 14.6 Integrated Child Development Service Programme (ICDS)
- 14.7 Food Security Programmes
- 14.8 Answers to Check Your Progress Questions
- 14.9 Summary
- 14.10 Key Words
- 14.11 Self Assessment Questions and Exercises
- 14.12 Further Readings

14.0 INTRODUCTION

‘Right to health’ is one of the fundamental rights. WHO also states that enjoyment of highest attainment standard is the fundamental right of every citizen. It is the responsibility of the State to ensure good health and nutritional wellbeing of its entire people (Article 21 of Indian Constitution). Although India has always focused on “Right to Health”, but in spite of that the presence of inequitable distribution of wealth and subsequently the services has always burdened the country by both communicable and non-communicable diseases. In this unit, you will learn all the aspects related to health and nutritional status.

14.1 OBJECTIVES

After going through this unit, you will be able to:

- Discuss nutrition monitoring and its current programmes
- Explain the meaning of Nutrition Surveillance System
- Describe the elements of Integrated Child Development Services (ICDS) Programme
- Explain Nutrient Deficiency Control Programme, Supplementary Feeding Programme and Food Security Programme

14.2 AN OVERVIEW OF NUTRITIONAL STATUS IN INDIA

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Let's begin this section with a discussion on the common nutritional deficiencies in India:

1. Protein energy malnutrition

PEM occurs very frequently in infants and preschoolers (2 to 4 years of age) of developing countries like India where the diets are lacking in proteins, calories, vitamins and minerals. PEM occurs in two forms:

- a) Kwashiorkor
- b) Marasmus

Kwashiorkor

The term “kwashiorkor” means “the disease which a child gets when the next baby is born”, that is, “it is the sickness of the child who is deposed”.

Signs and symptoms

- The first symptom that is observed is the failure in the normal growth of the child. This result is due to lack of intake of adequate calories (energy) and proteins in the diet.
- Oedema is observed in the extremities due to disturbed water and electrolyte balance in the body.
- In some individuals initially, apathy and peevishness is observed. This followed by listlessness and disinterest in the activities.
- The face becomes full-rounded; the symptom is often referred to as “moon face”.
- Enlarged liver.
- Fatty infiltration of liver due to disturbance in the lipid metabolism.
- Loss of appetite.
- Vomiting.
- Diarrhoea
- Skin changes to dark hyper pigmented patches
- Anaemia
- Deficiency of vitamin A (xerophthalmia)
- Deficiency of vitamin B (stomatitis and glossitis)

- Low serum albumin
- Low choline esterase levels, alkaline phosphatase, amylase and lipase
- Low blood glucose level
- Deficiency of minerals such as potassium due to presence of diarrhoea.

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Marasmus

Marasmus is commonly observed in the weaned infants of about 1 year of age due to the consumption of low calorie and low protein diet.

Signs and symptoms

- The most common symptom is diarrhoea that is followed by measles.
- Like kwashiorkor, marasmus cases have also reported the failure of growth in children. A very marked loss in weight of the child is observed.
- Muscle wasting
- Loss of subcutaneous fat
- Eye lesions due to deficiency of vitamin A
- Anaemia
- Low serum albumin

Treatment

An easily digestible high calorie diet, rich in proteins of high quality including all other essential nutrients is prescribed.

Table 14.1 Mineral Deficiencies

Nutrient	Diseases associated	Sources
Calcium	Calcium deficiency in children leads to rickets in children and Osteomalacia in adults. During ageing of an individual, the absorption of calcium decreases which results in demineralization of the bones. This is followed by porosity, thinness and fragility of bones known as osteoporosis.	Milk and milk products, sesame seeds, small dried fish, ragi, leafy vegetables etc are the chief sources of calcium. Meat, poultry and fish are poor sources of calcium.
Sodium	Hyponatremia Deficiency of sodium occurs during hot weather or as a result of heavy in hot climate, as a result of excessive sweating. Hyponatremia means low levels of sodium in the blood. It results in severe dehydration. There is lowering down of blood volume and blood pressure. This may result in failure of the circulatory system. Toxicity (hypernatremia): It results oedema, increased blood volume followed by increase in the blood pressure	It is normally consumed in the form of table salt (sodium chloride). About 6 to 8 gm of salt is consumed daily in a normal diet. That is, 0.6 to 3.5 gm of sodium is consumed daily in our diets.
*Potassium	Deficiency (hypokalemia): The level of potassium in the blood is below normal in hypokalemia. It can cause injury to myocardium and kidneys. The symptoms are muscular weakness, irritability, paralysis and tachycardia. Toxicity (Hyperkalemia): In this condition, the level of potassium in the blood is above the normal. The symptoms include cardiac and central nervous system depression.	Meat, milk, fruits and dark green leafy vegetables are important sources of potassium.

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Iron	Iron deficiency results in the reduction of the stored iron that is followed by reduction in haemoglobin concentration & size. The disease caused due to deficiency of iron is anaemia. It is very common among children, adolescent girls and expectant & nursing mothers in India. The symptoms include fatigue, lassitude, and breathlessness on exertion, giddiness and pallor of the skin. In some cases edema of the ankles is also observed. The Haemoglobin level of the blood is low (5 to 9 g/100ml). The normal haemoglobin level in the blood is 13 to 15 g per 100 ml. Anaemia is caused due to consumption of diets deficient in iron, protein and the vitamins of B complex group (folic acid, B-12, B6) and vitamin C. Loss of blood through illness, injury or haemorrhage and excessive loss of blood during menstrual periods also result in iron deficiency.	Sesame seeds, jaggery and green leafy vegetables are the richest sources of iron. Organ needs such as liver, kidney and heart are also rich in iron. Lean meats, eggs, pulses, nuts, dried fruits, whole grains and cereals are good sources of iron. Milk and milk products are poor sources of iron
Fluorine	Deficiency: As fluorine is widespread in nature, diseases caused due to deficiency of this mineral is very rare. When a diet lacks fluorine less than 1 to 2 ppm, then cases of dental fluorosis are reported. Toxicity: When the drinking water contains fluorine in excess amounts (3to 5 ppm), then cases of dental fluorosis have been reported. The symptoms include chalky white patches on the surface of the teeth that are followed by yellow and brown staining. The enamel becomes weak and gives a corroded appearance. When the concentration of fluorine exceeds 10 ppm, then hypercalcification of the bones takes place. This is known as skeletal fluorosis.	Fluorine is widely distributed in nature, that is, in soil, water, plants and animals. That is why, normal diet is normally never deficient in fluorine.
Zinc	Deficiency: The deficiency of zinc adversely affects the growth of individuals. Cases of dwarfism have been reported in adolescents who suffer from the deficiency of zinc. The deficiency also affects the development of genitals (hypogonadism). It has been found that deficiency of zinc also results in hypoguesia (loss of taste acuity).	Herrings, oysters, cereals, millets, pulses, oilseeds, nuts, liver, meat, fish and eggs are good sources of zinc.

Table 14.2 Vitamin Deficiencies

Vitamin name	Deficiency disease
Vitamin A Retinoids (retinol, retinoids and carotenoids)	Night-blindness and Keratomalacia
Vitamin B₁ Thiamine	Beriberi, Wernicke-Korsakoff syndrome
Vitamin B₂ Riboflavin	Ariboflavinosis
Vitamin B₃ Niacin, niacinamide	Pellagra
Vitamin B₅ Pantothenic acid	Paresthesia
Vitamin B₆ Pyridoxine, pyridoxamine, pyridoxal	Anemia peripheral neuropathy.
Vitamin B₇ Biotin	Dermatitis, enteritis
Vitamin B₉ Folic acid	Deficiency during pregnancy is associated with birth defects, such as neural tube defects
Vitamin B₁₂ Cyanocobalamin, hydroxycobalamin, methylcobalamin	Megaloblastic anemia
Vitamin C Ascorbic acid	Scurvy
Vitamin D Ergocalciferol, cholecalciferol	Rickets and Osteomalacia
Vitamin E Tocopherols	Deficiency is very rare; mild hemolytic anemia in newborn infants
Vitamin K phylloquinone, menaquinones	Bleeding diathesis

2. Nutritional status of pregnant women

- Can be assessed by birth weight of infants.
- In most cases of rural areas, institutional delivery is not practiced and most women give birth at home

- As a result, there is no system for assessing weight of infants. Also, life of mother and child is always at risk.
- Malnourished pregnant mothers give birth to low birth-weight newborns.
- Low birth weight babies (LBW) are susceptible to many infections and death.
- In rural India, women undergo pregnancy, in the age from one to fourteen. nutritional status of pregnant women
- They often experience a miscarriage or child death.

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Role of breast feeding in mother and child health

- Breastfeeding should be started within the first hour after birth.
- It helps in reducing neonatal mortality.
- It prevents hypothermia in infant and establishes a bond between the mother and her child.
- It reduces risk of post-partum haemorrhage in mother, which is one of the leading causes of maternal mortality.
- Colostrum is the milk produced by the mother just after delivery during the first post-partum days. It contains antibodies and essential nutrients that act as immunization and helps in building up immune system of the infant.
- It helps in reducing the neonatal death

Reasons for miscarriage or child death:

- Mothers do not receive ante-natal care and institutional deliveries are lacking.
- Poor access to healthcare services.
- Improper training of the healthcare workers.
- Lack of nutritional knowledge for mothers and infants during the postpartum period
- Infants are not given regular immunizations to prevent diseases.
- Traditional beliefs and taboos about foods suitable during pregnancy and lactation lead to mothers being malnourished during pregnancy. This makes them susceptible to infections.
- Mother malnutrition is also affected by recurrent pregnancies. This results in low birth-weight babies with delayed development and also infant mortality.
- Local perceptions about health care services prevent them from learning about health, food and nutrition. As a result, traditional practices persist.

3. Common diseases observed in undernourished population:

- Gastritis in adults and diarrhoea among children are common gastro-intestinal disturbances

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- Malaria, Respiratory tract infections, coughs, colds and fever are common diseases among children.
- Pulmonary diseases are usually common in adults.
- Tobacco smoking is causative factor for cancers and pulmonary diseases.
- Lack of personal and environmental sanitation and hygiene results like parasitic infection.
- Nutritional deficiencies are common in population especially vitamin B deficiency in women of reproductive age. Night blindness and other vitamin A deficiency disorders are also common. Iodine deficiency disorders (cretinism and goitre) are prevalent in iodine-deficient localized areas
- Diet is insufficient in both quality and quantity, leading to low productivity and poor health

14.2.1 Nutrition Surveillance

The idea of nutrition surveillance has gotten from ailment observation, and signifies ‘to look out for sustenance, so as to settle on choices that lead to upgrades in nourishment in populaces’. Three particular targets have been characterized for reconnaissance frameworks, principally in connection to issues of lack of healthy sustenance in developing nations: to help long haul arranging in wellbeing and improvement; to give contribution to program the board and assessment; and to give opportune cautioning of the requirement for intercession to counteract basic disintegrations in nourishment utilization.

Choices influencing nourishment are made at different managerial dimensions, and the employments of various sorts of dietary observation data can be identified with national strategies, improvement programs, general wellbeing and sustenance programs, and convenient cautioning and intercession programs. The data should answer explicit inquiries, for instance concerning the healthful status and patterns of specific populace gatherings.

Characterizing the utilizations and clients of the data is the main fundamental advance in structuring a framework; this is delineated with reference to agrarian and country improvement arranging, the wellbeing part, and nourishment and social welfare programs. The most regular information yields are dietary result markers (e.g., pervasiveness of lack of healthy sustenance among preschool youngsters), disaggregated by engaging or grouping factors, of which the commonest is essentially authoritative zone. Regularly, extra “status” markers, for example, nature of lodging or water supply, are exhibited in the meantime. Then again, convenient cautioning requires prior markers of the likelihood of dietary crumbling, and horticultural pointers are frequently the most suitable. In the succeeding sections, you will study the different nutrition monitoring and its current programmes.

Check Your Progress

1. What is marasmus?
2. How much sodium is consumed daily in human diets?
3. List some of the sources of potassium.

NOTES

14.3 SUPPLEMENTARY FEEDING PROGRAMMES

In this section, we will discuss some of the supplementary feeding programmes.

Special Nutrition Programme

The special Nutrition Programme (SNP) was launched in the country in 1970-71. It provides supplementary feeding to the extent of about 300 calories and 10 grams of proteins to pre-school children and about 500 calories and 20 grams of protein to expectant and nursing mothers. Information originate from two primary kinds of source: regulatory (e.g., facilities and schools) and family unit test studies. Each source has its own focal points and inconveniences: for instance, authoritative information regularly as of now exist, and can be disaggregated to town level, yet are of obscure representativeness and frequently can't be connected with different factors of intrigue; test reviews give coordinated information of pretty much known representativeness, yet test sizes typically don't enable disaggregation to, for instance, explicit towns. A mix of these sources, with a capacity for specially appointed studies (formal or casual) is regularly the best arrangement. At long last, much relies upon sufficient offices for information investigation, despite the fact that straightforward, intelligible information yields are what is required. Intersectoral collaboration is expected to give practical alternatives to the basic leadership process 300 days a year. At present SNP is operated, as a part of the Minimum Needs Programme in the various states. The nutrition component of the ICDS programme is funded by States and Union Territories from the SNP budget. At present about 21.5 million beneficiaries are covered under this programme.

Balwadi Nutrition Programme

The Balwadi Nutrition Programme (BNP) is being implemented since 1970-71 through five national level voluntary organizations. The Central grant is given for supplementary feeding of children. It consists of 300 Calories and 10 gm. of protein per child per day for 270 days a year. During 1991-92, about 0.23 million children in the age group 3-5 years in 5640 balwadis were covered by the scheme.

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Wheat Based Supplementary Nutrition Programme

A centrally sponsored scheme called Wheat-based Supplementary Nutrition Programme (WNP) was introduced in 1986. This programme follows the norms of SNP or of the nutrition component of the ICDS. Central assistance for the programme consists of supply of free wheat and supportive costs for other ingredients, cooking, transport etc. At present around 3 million children and expectant and nursing mothers are covered under this programme. This scheme is now being transferred to the State Sector.

Tamil Nadu Integrated Nutrition Programme

Tamil Nadu Integrated Nutrition Programme (TINP) is being implemented in the State of Tamil Nadu since 1981. At present the scheme covers 316 blocks in Tamil Nadu. Under this project nutritional surveillance and supplementary nutrition is being provided to children below six years and expectant and nursing mothers. The project is assisted by World Bank. The total outlay for the project is ₹ 321 crores.

14.4 NUTRIENT DEFICIENCY CONTROL PROGRAMMES

The problem of malnutrition in India is a big problem and the Government has launched a variety of programs to deal with the problem of malnutrition. In 1993 the formulation of The National Nutrition Policy by the Government of India was done. Government of India has launched many programs out of which some are not functional now but some are running very successfully by the Government.

Deficiency of any particular vitamin or mineral has become a very common feature now a day in children and even adults. The reason for this deficiency is the insufficient intake of nutrient in the form of food in their diet for a long time. These disorders can be prevented if one takes diet-rich in vitamins/minerals and other nutrients. Due to the cost factor the underprivileged, poor people cannot afford this food. The Government also faces problems in making this food readily accessible to the lower economic classes of our society quite frequently.

As a substitute strategy, prophylaxis (preventive) programmes have been organized. These programmes specifically target illness due to lack of nutrients in the food, vitamins and minerals which are prepared commercially are supplied to food insecure section of the society through structured programmes. These programmes help people get quality food with all the nutrients which are required in an average human being of a given age group as these programmes are very

useful in covering the gap they are called nutrient deficiency control programmes or prophylaxis programmes and are of nature of stop-gap arrangement'. As and when the economic status of these families changes for the better they start consuming balanced diets with greater quality these are expected to be ratchet down.

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1. Nutritional Anaemia Prophylaxis Programme

The Government of India launched a Prophylaxis programme in 1970 to prevent nutritional anaemia in mothers and children. Under the programme, the expectant and nursing mothers as well as women acceptors of family planning are given one tablet of iron and folic acid containing 60 mg elemental iron (180 mg of ferrous sulphate and 0.5 mg of folic acid) and children in the age group 1-5 years are given one tablet of iron containing 20 mg elemental iron (60 mg of ferrous sulphate and 0.1 mg folic acid) daily for a period of 100 days. This programme covered children and pregnant women with haemoglobin level less than 8 gm per cent and 10 gm per cent respectively. There has been an increase in the number of beneficiaries under this programme from 3.52 million in 1975-76 to 41.20 million in 1988-89. About 30 million women and 50 million children have, however, been identified as eligible beneficiaries for the prophylaxis programme. During 1988-89, the programme envisaged to cover 22 million women and 30 million children. Fortification of salt with iron, a universally consumed dietary article, has been identified as a measure to control anaemia. Efficacy of fortified salt in both rural and urban communities was assessed by a multicentric study and revealed that iron fortified salt when consumed over a period of 12-18 months reduced prevalence of anaemia significantly. Accordingly, fortification of salt with iron as a public health approach is piloted in Tamil Nadu and Rajasthan.

2. Prophylaxis Programme Against Blindness Due to Vitamin A Deficiency

The programme was initiated by the Government in 1970. Under this programme children in age group 1-5 years are given an oral dose of 0.2 million I.U. of Vitamin A in oil - every 6 months.

3. Goitre Control Programme

A National Goitre Control Programme was initiated by the Government of India in 1962 to identify goitre endemic regions and to assess the impact of goitre control measures. The availability and production of iodized salt, strengthening of administrative machinery controlling the entry of non-iodized salt in the endemic regions have been recommended as measures to improve the implementation of the programme. There is an increasing awareness about the broad spectrum of Iodine Deficiency Disorder (IDD) in the country.

Programmes executed by Central Government

Table 14.1 The Mission and objectives of Ministry of Health and Family Welfare are as follow:

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Mission	Objectives
1. Ensuring accessibility of quality healthcare on impartial and affordable basis across regions and communities with particularly on underprivileged population.	1. Improving access to primary health care services for all sections of society.
2. Providing comprehensive primary healthcare delivery system which is efficiently linked to secondary and tertiary care health delivery system.	2. Improving Maternal and Child health.
3. Lowering down Infant Mortality Rate	3. Ensuring a reduction in the growth rate of population with a view to achieve population stabilization.
4. Reducing the incidence of communicable diseases and non-communicable diseases.	4. Developing human resources for health to achieve health goals. 5. Reducing overall disease burden of the society.
5. Targeting on population control in the country.	
6. Improving the training competence for providing human resources for health (medical, paramedical and managerial) with sufficient skill mix at all levels.	6. Strengthening Secondary and Tertiary health care.
7. Controlling health service delivery and endorse reasonable use of pharmaceuticals in India.	

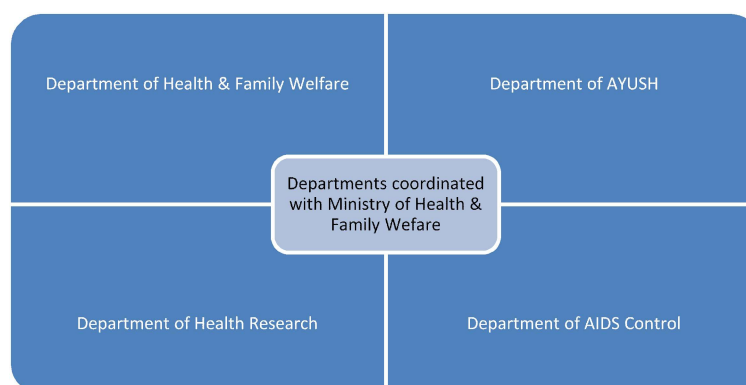


Fig. 14.1 Departments Coordinated with Ministry of Health and Family Welfare

The National Rural Health Mission (NRHM)

It was launched in 2005, to provide accessible affordable and quality healthcare to the population, particularly to people living in rural areas. The various initiatives under NRHM aim to close the Inter regional and interstate inequalities to promote provision of equitable health services. The NRHM has been able to provide health services to the most underprivileged households in the remotest areas targeting to enhance the public health systems, reducing morbidity, mortality and community owned decentralized health care delivery system with recurrent planning as per the needs and requirements.

Check Your Progress

4. What is recommended in the special nutrition programmes?
5. What does the central assistance in Wheat-based Supplementary Nutrition Programme consist of?
6. What is provided under the Prophylaxis Programme Against Blindness Due to Vitamin A Deficiency?

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14.5 SCHOOL HEALTH PROGRAMME

School health which is an imperative division of community health got its recognition during the past 70 years. The concept came into notice from the conception of medical examination of school children and comprehensive care of the health and well being of children throughout the school years.

In India due to poverty and prevailing socio- cultural environment a significant number of school children from paediatric age to adolescent suffer from a range of diseases. These can be prevented if diagnosed and treated before time and preventive measures taken in time. In Delhi, The Directorate of Health Services, started School Health Scheme in 1979 with six School Health Clinics initially to provide comprehensive health care services to the school going children. The scheme was expanded during the 7th five year plan and 64 school clinics were opened.

Childhood is the first stage of understanding the significance of positive health. The best place for educating and training the positive health behaviour is 'the school'. Convergence of school enrolments with health and education programmes laid the basis for the introduction of school health services in India that started in 1909. The first medical exam started in the school children in Baroda. Keeping in view the vision of NRHM, the Ministry of Health and family welfare has started the school health programme.

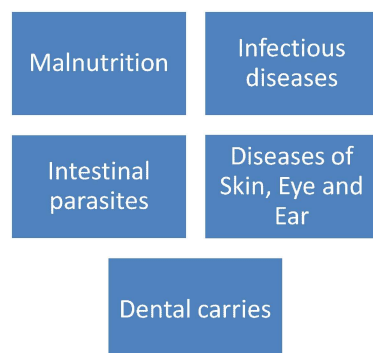


Fig. 14.2 Major class of health problems of school children

An effective school health, hygiene and nutrition programme offers several benefits:

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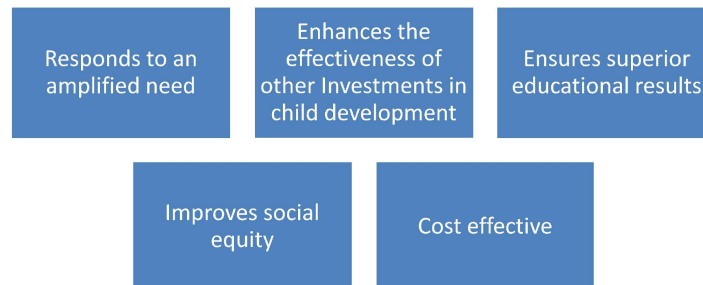


Fig. 14.3 Benefits of Hygiene and Nutrition Programmes for School Children

- A child survival programme can only be made successful with the continuous efforts of the government and society by spreading out basic education coverage and motivating greater number of children to attend the school, particularly girls.
- School Health Programmes lay the foundation of early child care and development programmes.
- Continuing good health at school age is essential for enhanced formal learning resulting in maintaining better future and consequently an increased productivity in adulthood.
- The school health programmes not only assist in prevention of health problems, their early detection and management but also motivate the children to follow healthy lifestyles.
- Good health practices not only prevent lifestyle related disorders in adulthood but also help in prevention of communicable diseases like HIV/AIDS.
- These programmes help in increasing school enrolment and attendance, along with increased level of learning. This is particularly important for underprivileged children especially the rural girls, rural children with disabilities. These children are the actual target beneficiaries of this programme.
- School health programmes prove to be cost effective as they link-up resources viz. health, education, nutrition, and sanitation to the school. These basic resources lay the foundation for development of young children.
- The school health programmes provide sustainability due to following reasons:
 - o These programmes are universal
 - o Coverage of these programmes are considered to be greater as compared to other health programmes.
 - o The school contains an efficient workforce that already works in association with the community

Elements of school health programmes

The success of School Health Programmes lies in planned collaboration of health and education departments along with community participation. The main objective of School Health Programmes is to provide a complete package of preventive, promotive and curative health services in order to improve the current health status of the school going children. As discussed earlier, School Health Programmes help in promotion of healthy lifestyles. The essential elements of school health programmes are as follows:

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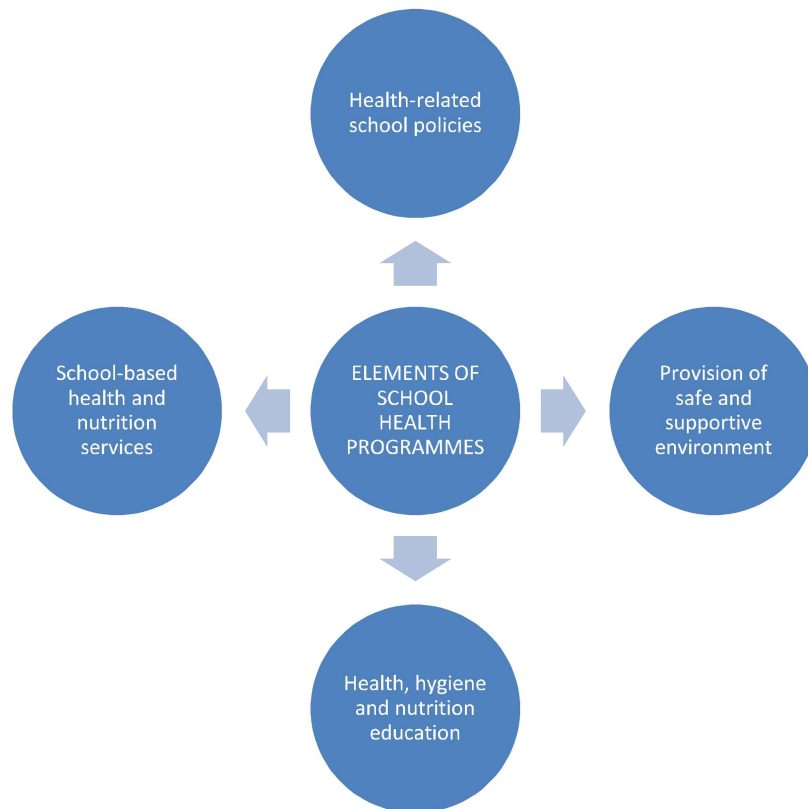


Fig. 14.4 Essential Elements of School Health Programmes

Health-related school policies

Includes:

- Encouraging healthy lifestyles, educate about major public health problems
- Enabling to converge the efforts of students with their parents and departments of health, education, women and child development. On the other side to bring about convergence.

Provision of safe and supportive environment includes:

- Ensuring healthy development of students and provide a healthy learning through a safe and supportive environment

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- Relieving the hunger of the child particularly of underprivileged sections of the society along with provision of safe water and adequate sanitation, inculcating hygienic practices.
- Providing privacy to females, for e.g. providing women toilets and educating menstrual management
- Providing environment which is free of violence and discrimination

Health, hygiene and nutrition education includes:

- Inculcating knowledge, attitude, values, healthy practices and other life skills
- Providing sanitary washrooms with running water supplies along with soap and water for hand washing facility
- Providing of sanitary napkins for girls
- Promoting kitchen garden to demonstrate for emphasizing growing healthy food.

School-based health and nutrition services includes:

- Providing equitable, simple, sustainable, safe school-based health and nutrition services
- Understanding of health issues in the current system
- Provide students on specific health issues like menstrual hygiene

Table 14.3 School Health Programmes: Intervention

Intervention	Outcomes
Health nutrition and education	<ul style="list-style-type: none"> • Health promotion • Prevention of lifestyle related disorders • Prevention of malnutrition
Education for development	<ul style="list-style-type: none"> • Improvement in behavioural development like self esteem
Sex education and reproductive health education	<ul style="list-style-type: none"> • Improvement in behavioural development and educating about sexually transmitted diseases
Health screening	<ul style="list-style-type: none"> • Early detection and management of common diseases found in developmental stages for e.g., vision check-up, oral health issues etc
Nutrition and anaemia management	<ul style="list-style-type: none"> • Enhancing nutrition • Prevention and treatment of anaemia by distribution of IFA tablets • Distribution of vitamin A supplementation • Deworming • Distribution of iodised salt
Immunization	<ul style="list-style-type: none"> • Protection from tetanus • Periodic session of T.T. at the age of 10 and 16 years
Referral services	<ul style="list-style-type: none"> • Improved access to health services • Curative services • Remedial measures for problems detected in screening • Provision of drugs and first aid kit • Provision of spectacles and hearing aids
Training of teachers	<ul style="list-style-type: none"> • Capacity building • Enhanced communication skills • Educating about health, hygiene and nutrition • Creation of safe and supportive environment • Screening of common diseases • Documentation and reporting

Rashtriya Bal Swasthya Karyakram (RBSK)

Rashtriya Bal Swasthya Karyakram (RBSK) is a scheme which was targeted to screen children from 0 to 18 years for 4 Ds - Defects at birth, Diseases, Deficiencies and Development Delays including Disabilities. Under this programme free of cost treatment at tertiary level is provided to children diagnosed with the aforementioned illnesses under NRHM. This massive initiative is executed through a systematic approach focussed in protecting and promoting the health of children resulting in improvement in health status, and survival and development of children.

NRHM epitomizes a strong association between Central and State Governments in order to enhance the positive impacts of health interventions particularly to the underprivileged segments of population.

In the previous years, government of India had been successful reducing mortality in children. This achievement can be triggered by early detection and management of health conditions in children. This is quite obvious that, improvements in health care and intensive care facilities increase the incidence of survival of infants with birth defects and inborn errors of metabolism. The burden of non-communicable diseases can also be controlled on timely and appropriate interventions executed.

The Ministry of Health and Family Welfare under the National Rural Health Mission has launched the Child Health Screening and Early Intervention Services. It is an organised approach of early identification of diseases and its timely care, support and treatment. The government report states that about 270 million children including the newborn and those attending Angawadi Centers and Government schools are served through this programme.

For improving the quality of life, an efficient and effective health intervention decrease both direct costs and out-of-pocket expenditure as this facilitates in reducing the extent of disability. Child Health Screening and Early Intervention Services was initiated in the purview of this approach.

‘Continuum of care’ over different phases of the life of a child (particularly the first 18 years) is the salient feature of this programme. The programme aims at improved collective human potential of the nation with reduced risk factors, morbidity and mortality.

As the early years of an individual’s life are the most critical years with respect to survival and development that is why, it is essential to identify health conditions, risk factors, required medical care and provision of early intervention during these years. It is well known that India has a high incidence of birth defects, deficiencies, diseases specific to childhood and developmental disorders including disabilities. Approximately, 6% of children are born with birth defects, 10% children are affected with development delays leading to disabilities, also, 4% of under-five mortality and 10% of neonatal mortality occur due to birth defects.

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It is now obvious to say that, early intervention would result in increased survival, reduction of malnutrition, improvement of cognitive development and educational accomplishment and largely improvement of quality of life. It would also be helpful in bringing down both out of pocket expenses for treatment of diseases and disabilities along with alleviating pressure on health system.

The target groups and implementation mechanism are as follows:

- Babies born at public health facilities and home: age group from birth to six weeks:
 - o Implementation mechanism
 - Facility based newborn screening at public health facilities, by existing health manpower.
 - Community based newborn screening at home through ASHAs for newborn till 6 weeks of age during home visits
- Preschool children in rural areas and urban slums: age group from 6 weeks to 6 years
 - o Implementation mechanism
 - Anganwadi Center based screening by the dedicated Mobile Health Teams
- Children enrolled in classes 1st to 12th in Government and Government aided schools: age group from 6 years to 18 years
 - o Implementation mechanism
 - Government and Government aided school based screening by dedicated Mobile Health Teams
 - This team includes the following
- Medical officers (AYUSH) - 1 male and 1 female at least with a bachelor degree from an approved institution (2 in number)
- ANM/Staff Nurse (1 in number).
- Pharmacist with having skills in computer for data management (1 in number) or Lab Technician or Ophthalmic Assistant with proficiency in computer for data management (1 in number).



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Fig. 14.5 Health Conditions for Child Health Screening and Early Intervention Services

Reproductive and Child Health (RCH) programme

Reproductive and Child Health (RCH) programme is a comprehensive programme, run by the Government of India's (GoI) National Health Mission (NHM). It was in April 2005 in association with the State government. RCH is dependable on Government of India's National Population Policy-2000, the National Health Policy-2001 and the Millennium Development Goals. The programme targets to deliver the RCH targets for diminution of maternal and infant mortality and total fertility rates. RCH programme targets to decrease social and geographical inequalities in entrée to and deployment of quality reproductive, maternal, newborn, child and adolescent health services.

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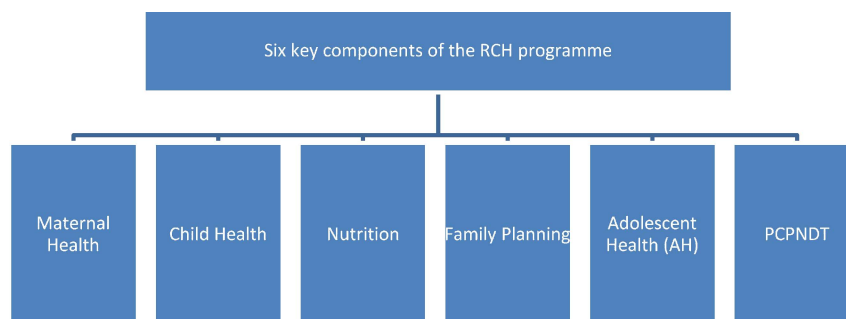


Fig. 14.5 Components of RCH Programme

Before describing the school health services in detail, it is essential to understand briefly, the other related health services provided by the Government.

Maternal health

Maternal health is vital to the development of any country with respect to increasing equity and reducing poverty and formation of social capital. India has made significant advancement in lowering down maternal deaths in the previous years. The survival and well-being of mothers is essential in their own right but are also vital to target large broader, economic, social and developmental challenges. Maternal Mortality Ratio (MMR) is one of the key indicators to evaluate the quality of health services in any country. This programme focuses on the following:

- Janani Shishu Suraksha Karyakram (JSSK), Janani Suraksha Yojana (JSY) was started on 12 April 2005. It is a safe motherhood intervention under the National Health Mission (NHM). It is one of the largest schemes in the world and is being implemented with the objective of reducing maternal and neonatal mortality. This is accomplished by promoting institutional delivery among pregnant women. It focuses on cash support with delivery and post-delivery care using Accredited Social Health Activist (ASHA). It is as an efficient link between the government and pregnant women.
- Providing Essential and Emergency Obstetric Care
- Management of Sexually Transmitted Infections and Reproductive Tract Infections (RTI and STI) Village Health & Nutrition Days (outreach services for comprehensive Maternal and Child Health Care)
- A Joint Mother and Child Protection (MCP) Card of Ministry of Health & Family Welfare (MoH&FW) and Ministry of Women and Child Development (MoWCD) is being used by all States as a tool for monitoring and improving the quality of MCH and Nutrition interventions.
- A name, telephone, address based web enabled system has been introduced by Government of India to track every pregnant women and child in order to ensure and monitor timely services to them including ANC, JSY benefit, Immunization etc.

Child health programme

The Child Health programme under the National Rural Health Mission (NRHM) systematically incorporates interventions that improve child survival and combats factors contributing to infant and under-five mortality. Child survival cannot be tackled in isolation because it is linked to the health of the mother. In turn, the health of the mother is dependent on her health and development as an adolescent. This is called 'Continuum of Care'. This concept lays stress on care during essential life stages in order to improve child endurance. This programme also ensures that critical services are provided at home, through community outreach and through health facilities at various levels (primary, first referral units, tertiary health care facilities). The newborn and child health are the two key targets of the Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) strategic approach, 2013. India was determined to reduce child deaths by two-thirds between 1990 and 2015 as decided in the Millennium Development Goals (MDG).

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Adolescent Health

Targeting Adolescent Health includes the following programmes:

- (A) Adolescent Reproductive and Sexual Health programme (ARSH),
- (B) Menstrual Hygiene Scheme (MHS)
- (C) Weekly Iron and Folic Acid Supplementation Programme (WIFS) components.

The Government had started Rashtriya Kishor Swasthya Karyakram (RKSK) includes these components into a comprehensive programme.

The salient features of RKSK are as below:

- (A) Adolescent Reproductive and Sexual Health (ARSH) programme:

Adolescent Reproductive and Sexual Health programme targets on restructure the existing public health system targeting health service needs of adolescents by providing promotive, preventive and curative services at Adolescent Friendly Health Clinics. There are 697 dedicated Adolescent Health counsellors to provide counselling services in Adolescent Friendly Health Clinics

- (B) Scheme for Promotion of Menstrual Hygiene:

The Scheme for Promotion of Menstrual Hygiene was primarily started for rural adolescent girls in the age group of 10-19 years. This programme targets in providing sufficient knowledge and information girls in rural areas about menstrual hygiene and have access to high quality sanitary napkins along with safe disposal mechanisms. This includes the following:

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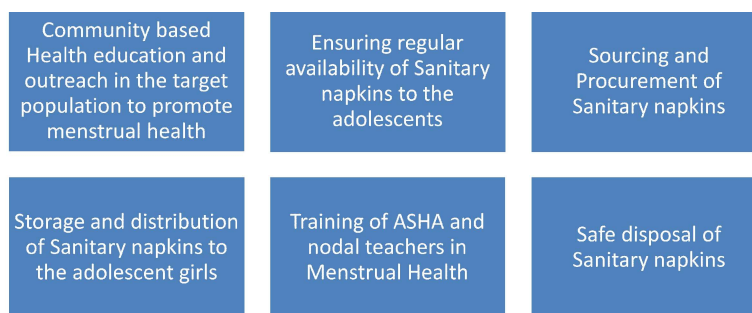


Fig. 14.6 Elements of Scheme for Promotion of Menstrual Hygiene

Weekly Iron and Folic Acid Supplementation (WIFS) Programme:

The goal of Weekly Iron and Folic Acid Supplementation (WIFS) Programme is to break the intergenerational cycle of anaemia while the short term goal is to provide of a nutritionally improved human capital. WIFS programme includes:

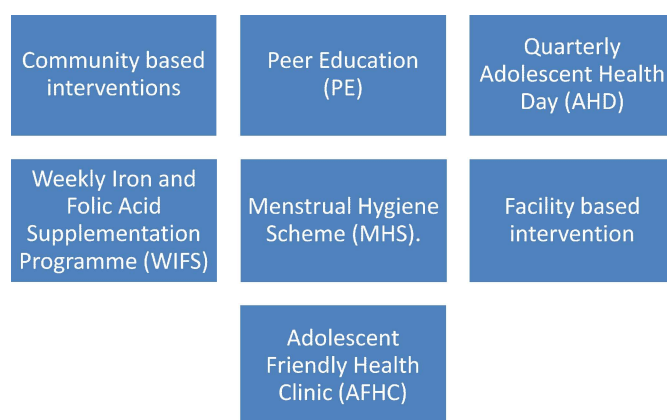
- Weekly controlled administration of Iron and Folic Acid supplements to in-school adolescent girls and boys and out-of-school adolescent girls, suffering from moderate/severe anaemia
- Biannual de-worming
- Providing information and counselling

WIFS aims at adolescents between the age of 10-19 years. Under this programme, adolescents from government/government aided and municipal schools in classes 6th to 12th are targeted.

Rashtriya Kishor Swasthya Karyakram (RKSK)

Rashtriya Kishor Swasthya Karyakram th(RKSK) was started on 7 January 2014 in order to adolescents. Rashtriya Kishor Swasthya Karyakram was started keeping in mind that adolescence is the most important stage of the life. The significant features of RKSK are:

- RKSK provides information, counselling and services to adolescent at the facilities
- Targets to combat malnutrition, injuries and violence, noncommunicable diseases, mental health
- Providing clinic-based services for encouragement of adolescents in schools and communities.



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Service to be provided at the Adolescent Health Day

Information

- IEC and IPC on Nutrition
- SRH
- Mental Health
- GBV
- NCD
- Substance misuse.

Commodities

- Sanitary Napkins
- IFA
- Albendazole
- anti-spasmodic tablets
- contraceptives.

Services

- Registration
- general health checkup, (BMI, anaemia and diabetes)
- Referral to AFHCs (for counselling and clinical services)

Fig. 14.7 Package of services offered under RKSK

Table 14.5 Adolescent Friendly Health Services

Service package Level	SC, PHC, CHC and DH
ANC for pregnant adolescents	All levels
Counseling on Nutrition, Skin, Pre-marital Counseling, Sexual Problems, Contraceptive, Abortion, RTI/STI, Substance abuse, Learning problems, Stress, Depression, Suicidal Tendency, Violence, Sexual Abuse, Other Mental Health Issues	All levels (by ANM at SC)
Other adolescent specific health services including menstrual disorders, injuries (accidents & violence) and NCD like hypertension, stroke, cardio-vascular diseases and diabetes	PHC, CHC, DH
Treatment by specialists	CHC, DH
Referral	All levels

(Source: Ministry of Health and family welfare)

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National Oral Health Program (NOHP)

World Health Organization (WHO) states that, 'Oral health is a state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity'.

Oral health is vital for the comfort and improving the quality of life. Oral health affects the growth and development of various facets of human development. The two most widespread oral diseases in India are:

- Dental caries
- Periodontal disease

This spectrum of health i.e. oral health had not been paid much attention particularly in lower income group. Lack of awareness and awareness regarding proper oral care could be the main cause in the Indian population.

Oral diseases are related to bacterial endocarditis, atherosclerosis, chronic obstructive lung diseases and preterm low birth weight. Periodontal health has been related to diabetes.

In some states, Dental units are set up in the Primary Health Centre.

Govt. of India has structured the National Oral Health Program [NOHP] for a reasonable, accessible and unbiased oral health care delivery in a well synchronized approach.

Table 14.6 Burden of Oral Diseases (Multi-centric survey 2007)

S.No.	Disease	Prevalence
1	Dental Caries	40-45%
2	Periodontal diseases	>90% (Advanced disease in 40%)
3	Malocclusion	30% of children
4	Cleft lip and palate	1.7 per 1000 live births
5	Oral cancer	12.6 per lakh population
6	Oral submucous fibrosis (pre-malignant and crippling condition of mouth)	4 per 1000 adults in rural India
7	Dental Fluorosis	Endemic in 230 districts of 19 States
8	Edentulousness (tooth loss)	19-32% of elderly population >65 years
9	Oral lesions due to HIV/AIDS	72% of HIV/AIDS patients
10	Birth defects involving oro-facial complex	0.82 to 3.36 per 1000 live births
11	Others: Traumatic injuries, • Mucosal lesions associated with radiation and chemotherapy • Morbidity and deformity following oral cancer surgery.	

The main objectives of this programme are as follows:

- To improve the determinants of oral health
- To decrease morbidity from oral diseases

- To integrate oral health promotion and preventive services with general health care system
- To motivate Promotion of Public Private Partnerships (PPP) model for accomplishing better oral health
- To train teachers of school regarding oral care
- To conduct health promotion activities in schools

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14.6 INTEGRATED CHILD DEVELOPMENT SERVICE PROGRAMME (ICDS)

This is an exclusive programme for women and children. This programme provides a package of integrated services including supplementary nutrition, immunization, health check up, referral and education service.

Objectives

- Improvement of the nutritional and health status of children particularly in the age group 0-6 years
- Laying the basis for proper psychological, physical and social development of the child
- Reduction of the incidence of mortality, morbidity, malnutrition and school withdrawal
- Regulation of effective synchronization of policy and programme implementation amid various departments to support child development
- Enhancement of the potential of the mother through proper nutrition education

Brief description of ICDS

- One ICDS project envelops either a tribal or a rural Block, the territorial unit at sub-district level or a cluster of urban slums in an urban project depending on the proportion of the population
- Initially the programme covered 33 Blocks/slums in 1975-76 and expanded to 66 Blocks.
- International agencies like UNICEF also support and endorse the programme. (Annual Report, Min. of Women & Child Dev., 1993-94)
- It is said that lack of community participation and excessive dependence on Government has also been observed.
- Few reports suggest that more exhaustive training and motivation of ICDS workers is also required.
- Continuous growth monitoring is essential for better outcomes of the programme.

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- Arrangements for clinical intervention in the required high-risk groups is also important.
- National Institute of Nutrition (NIN), Hyderabad has started the nutrition surveillance in ICDS blocks in Andhra Pradesh on pilot basis for achieving the aforementioned purposes.
- The programme can be made more successful by delivering a package of services and motivation of the village people for gaining support to the programme.
- Anganwadi worker is usually a girl from the village itself who is responsible for enabling the children and women, perhaps of her own community, to derive the benefits from the programme.

Creches for Children of Working and Ailing Women

The scheme was started in 1975 in order to free the working, and unhealthy mothers, from the task of taking after their children during work or illness. The parent's monthly income should not exceed ₹ 1800 to avail the programme for their children. This group usually belongs to migrant vendors, construction labourers groups etc. The following services are available to the children:



Fig. 14.8 Benefits of Creches for Children of Working and Ailing Women

Central Social Welfare Board executes this scheme. The board provides grants-in-aid to a range of non-governmental organisations to supervise the creches. Indian Council for Child Welfare and Bhartiya Admijati Sewak Sangh also execute this scheme.

14.7 FOOD SECURITY PROGRAMMES

Let's discuss some food supplementation programmes.

World Food Programme Project

World Food Programme-UN supplies food-stuffs so that supplementary nutrition could be provided through the projects supported by them. Majorly, WFP's provides aid to Indian projects in forestry, irrigation and supplementary nutrition.

WFP's food assistance targets on poverty mitigation, by targeting the most vulnerable section of the society. Soya Fortified Bulger Wheat, Corn Soya

CARE Assisted Nutrition Programmes

CARE-India provides food aid in order to enhance the supply of supplementary nutrition. The CARE assistance is now merged with ICDS projects and some of the ICDS projects deploy this assistance for the nutrition component of the programme. The programme covers ICDS projects in 10 States of the Indian Union.

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UNICEF Assistance for Women and Children

India has been connected with UNICEF since 1949 and is one of the chief countries to the extent that activities of UNICEF are concerned. UNICEF's assistance covers the following sectors in India:

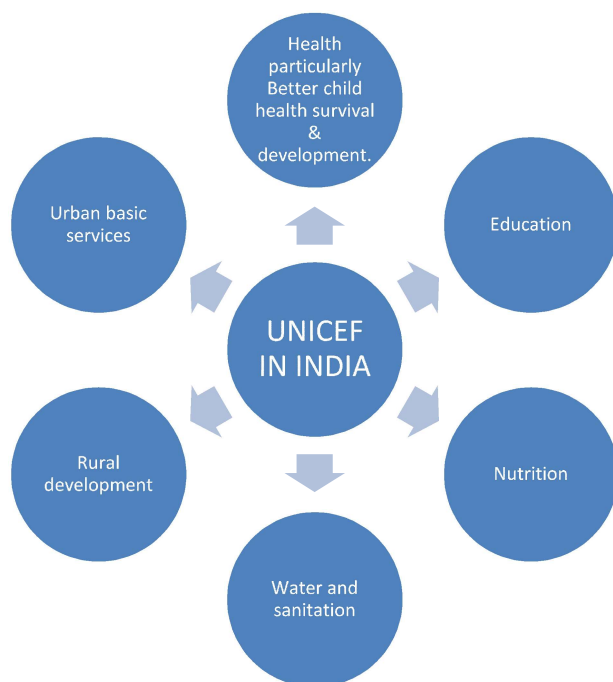


Fig. 14.9 Sectors of UNICEF India

Mid day meal programme

Mid Day Meal in schools had started in India in 1925, it was started for disadvantaged children in Madras Municipal Corporation. Later on, in 1980s, Gujarat, Kerala and Tamil Nadu and the UT of Pondicherry had also started Mid Day Meal Programme. During 1990-91, twelve more States initiated this mid day meal programme. In order to increase the enrolments in schools, retention of students for a longer time and regular attendance, the National Programme of Nutritional

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Support to Primary Education (NP-NSPE) was launched. The primary aim consequently also included enhancing nutritional status amongst the children. This scheme was centrally sponsored. It was launched on occasion of Independence Day on 15th August 1995. In the beginning phases, 2408 blocks were covered in the country but by the year 1997-98 the NP-NSPE covered almost all blocks of the country. The scheme was extended in 2002 cater children in classes I -V of Government, Government aided and local body schools, students of EGS and AIE centres. The scheme was aided by the Central government and included free supply of food grains @ 100 grams per child per school day, and subsidy for transportation of food grains up to a maximum of ₹ 50 per quintal.

The scheme was revised in September 2004. The aim was:

- To supply cooked mid day meal with 300 calories and 8-12 grams of protein to all children studying in classes I – V in Government and aided schools and EGS/ AIE centres
- To provide free supply of food grains
- To arrange aid from Central government for:
 - o Cooking cost @ Re 1 per child per school day
 - o Raising transport subsidy ₹ 50 per quintal to ₹ 100 per quintal for special category states, and ₹ 75 per quintal for other states
 - o Providing management, monitoring and evaluation costs @ 2% of the cost of foodgrains, transport subsidy and cooking assistance
 - o Providing mid day meal during summer vacation in drought affected areas.

The scheme was again revised in July 2006 for the following purposes:

- Providing aid for cooking cost at the rate of ₹ 1.50 per child/ school day for other States and UTs.

The scheme was again revised in October 2007 for following purposes;

- To provide the supplies to the children in classes VI to VIII particularly in Educationally Backwards Blocks (EBBs).

The government report states that since 1st April, 2008, the programme caters all children studying in Government, Local Body and Government-aided primary and upper primary schools and the EGS/AIE centres of the country. The calorific value (150 grams of food grains (rice/wheat) per child/school day) of a mid-day meal for the upper primary children consists of:

- Minimum of 700 calories
- Proteins: 20 grams

The following norms have been fixed up since 2009:

- Providing balanced and nutritious diet to children of upper primary group
- Quantity of pulses: 30 grams
- Quantity of vegetables: 75 grams
- Quantity of oil and fat: 7.5 grams
- Cooking cost (excluding the labour and administrative charges): ₹ 2.50 for primary and ₹ 3.75 for upper primary children

Over the years, there have several revisions in the programme:

In July 2006 the Scheme was further revised to enhance the cooking cost to ₹ 1.80 per child/school day for States in the North Eastern Region and ₹ 1.50 per child / school day for other States and UTs. The nutritional norm was revised to 450 Calories and 12 gram of protein. In order to facilitate construction of kitchen-cum-store and procurement of kitchen devices in schools provision for Central assistance @ ₹ 60,000 per unit and @ ₹ 5,000 per school in phased manner were made.

In October 2007, the Scheme was extended to cover children of upper primary classes (i.e. class VI to VIII) studying in 3,479 Educationally Backwards Blocks (EBBs) and the name of the Scheme was changed from 'National Programme of Nutritional Support to Primary Education' to 'National Programme of Mid Day Meal in Schools'. The nutritional norm for upper primary stage was fixed at 700 Calories and 20 grams of protein. The Scheme was extended to all areas across the country from 1.4.2008.

The Scheme was further revised in April 2008 to extend the scheme to recognized as well as unrecognized Madarsas / Maqtabas supported under SSA.

From the year 2009 onwards the following changes have been made to improve the implementation of the scheme:-

- Food norms have been revised to ensure balanced and nutritious diet to children of upper primary group by increasing the quantity of pulses from 25 to 30 grams, vegetables from 65 to 75 grams and by decreasing the quantity of oil and fat from 10 grams to 7.5 grams.
- Cooking cost (excluding the labour and administrative charges) has been revised from ₹ 1.68 to ₹ 2.50 for primary and from ₹ 2.20 to ₹ 3.75 for upper primary children from 1.12.2009 to facilitate serving meal to eligible children in prescribed quantity and of good quality. The cooking cost for primary is ₹ 2.69 per child per day and ₹ 4.03 for upper primary children from 1.4.2010. The cooking cost will be revised prior approval of competent authority by 7.5% every financial year from 1.4.2011.
- The honorarium for cooks and helpers was paid from the labour and other administrative charges of ₹ 0.40 per child per day provided under

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the cooking cost. In many cases the honorarium was so little that it became very difficult to engage manpower for cooking the meal. A Separate component for Payment of honorarium @ ₹1000 per month per cook- cum-helper was introduced from 1.12.2009. Honorarium at the above prescribed rate is being paid to cook-cum-helper. However, in some of the states the honorarium to cook-cum-helpers are being paid more than ₹1000/- through their state fund. Following norms for engagement of cook-cum-helper have been made:

1. One cook- cum-helper for schools up to 25 students.
 2. Two cooks-cum-helpers for schools with 26 to 100 students.
 3. One additional cook-cum-helper for every addition of upto 100 students.
- More than 25.25 lakhs cook-cum-helper are engaged by the State/ UTs during 2016-17 for preparation and serving of Mid Day Meal to Children in Elementary Classes:
 - A common unit cost of construction of kitchen shed @ ₹60,000 for the whole country was impractical and also inadequate .Now the cost of construction of kitchen-cum-store will be determined on the basis of plinth area norm and State Schedule of Rates. The Department of School Education and Literacy vide letter No.1-1/2009-Desk(MDM) dated 31.12.2009 had prescribed 20 sq.mt. plinth area for schools having upto 100 children. For every additional upto 100 children additional 4 sq.mt plinth area will be added. States/UTs have the flexibility to modify the Slab of 100 children depending upon the local condition.
 - Due to difficult geographical terrain of the Special category States the transportation cost @ ₹1.25 per quintal was not adequate to meet the actual cost of transportation of foodgrains from the FCI godowns to schools in these States. On the request of the North Eastern States the transportation assistance in the 11 Special Category States (Northern Eastern States, Himachal Pradesh, Jammu & Kashmir and Uttarakhand) have been made at par with the Public Distribution System (PDS) rates prevalent in these States with effect from 1.12.2009.
 - The existing system of payment of cost of foodgrains to FCI from the Government of India is prone to delays and risk. Decentralization of payment of cost of foodgrains to the FCI at the district level from 1.4.2010 allowed officers at State and National levels to focus on detailed monitoring of the Scheme.

Food Security in India

With a five-fold increase in food grain production from 50 million tonnes in 1950-51 to about 250 million tonnes in 2014-15, India has moved away from dependence on food aid to become a net food exporter. In 2016, the government launched a

number of programmes to double farmers' incomes by 2022. These seek to remove bottlenecks for greater agricultural productivity, especially in rain-fed areas. They include: the National Food Security Mission, Rashtriya Krishi Vikas Yojana (RKVY), the Integrated Schemes on Oilseeds, Pulses, Palm oil and Maize (ISOPOM), Pradhan Mantri Fasal Bima Yojana, the e-marketplace, as well as a massive irrigation and soil and water harvesting programme to increase the country's gross irrigated area from 90 million hectares to 103 million hectares by 2017.

The government has also taken significant steps to combat under- and malnutrition over the past two decades, such as through the introduction of mid-day meals at schools, anganwadi systems to provide rations to pregnant and lactating mothers, and subsidised grain for those living below the poverty line through a public distribution system. The National Food Security Act (NFSA), 2013, aims to ensure food and nutrition security for the most vulnerable through its associated schemes and programmes, making access to food a legal right.

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Conclusion

Health constitutes vital part of human development. Accessibility of affordable health care system is necessary for enabling good health care to the residents of the nation. This can be accomplished by joint effort among Centre, State Governments and various stake holders. Health is a measure of functional and metabolic efficiency of an individual. 'Right to health' is one of the fundamental rights. An efficient and effective healthcare service is required to improve the health status, productivity and income of the population. In India, healthcare delivery is represented by public sector, private sector, indigenous systems of medicine, voluntary health agencies and national health programmes.

Check Your Progress

7. Why do school health programmes provide sustainability?
8. List the four Ds covered by the Rashtriya Bal Swasthya Karyakram.
9. What does the ICDS programme provide?

14.8 ANSWERS TO CHECK YOUR PROGRESS QUESTIONS

1. Marasmus is commonly observed in the weaned infants of about 1 year of age due to the consumption of low calorie and low protein diet.
2. 0.6 to 3.5 gm of sodium is consumed daily in our diets.
3. Meat, milk, fruits and dark green leafy vegetables are important sources of potassium.

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4. Special Nutrition Programme provides supplementary feeding to the extent of about 300 calories and 10 grams of proteins to pre-school children and about 500 calories and 20 grams of protein to expectant and nursing mothers.
5. Central assistance for the Wheat-based Supplementary Nutrition Programme consists of supply of free wheat and supportive costs for other ingredients, cooking, transport etc.
6. Under the Prophylaxis Programme Against Blindness Due to Vitamin A Deficiency children in age group 1-5 years are given an oral dose of 0.2 million I.U. of Vitamin A in oil - every 6 months.
7. The school health programmes provide sustainability due to following reasons:
 - a. These programmes are universal
 - b. Coverage of these programmes are considered to be greater as compared to other health programmes.
 - c. The school contains an efficient workforce that already works in association with the community
8. Rashtriya Bal Swasthya Karyakram (RBSK) is a scheme which was targeted to screen children from 0 to 18 years for 4 Ds - Defects at birth, Diseases, Deficiencies and Development Delays including Disabilities.
9. ICDS programme provides a package of integrated services including supplementary nutrition, immunization, health check up, referral and education service.

14.9 SUMMARY

- PEM occurs very frequently in infants and preschoolers (2 to 4 years of age) of developing countries like India where the diets are lacking in proteins, calories, vitamins and minerals. PEM occurs in two forms:
 - o Kwashiokor
 - o Marasmus
- Nutritional status of pregnant women
 - o Can be assessed by birth weight of infants.
 - o In most cases of rural areas, institutional delivery is not practiced and most women give birth at home
- Breastfeeding should be started within the first hour after birth. It helps in reducing neonatal mortality. It prevents hypothermia in infant and establishes a bond between the mother and her child.

- Gastritis in adults and diarrhoea among children are common gastro-intestinal disturbances. Malaria, Respiratory tract infections, coughs, colds and fever are common diseases among children.
- The idea of nutrition surveillance has gotten from ailment observation, and signifies 'to look out for sustenance, so as to settle on choices that lead to upgrades in nourishment in populaces'. Three particular targets have been characterized for reconnaissance frameworks, principally in connection to issues of lack of healthy sustenance in developing nations: to help long haul arranging in wellbeing and improvement; to give contribution to program the board and assessment; and to give opportune cautioning of the requirement for intercession to counteract basic disintegrations in nourishment utilization.
- ICDS programme provides a package of integrated services including supplementary nutrition, immunization, health check up, referral and education service to the women and children of 0 to 6 years.
- Anganwadi worker is usually a girl from the village itself who is responsible for enabling the children and women, perhaps of her own community, to derive the benefits from the programme.
- Special Nutrition Programme (SNP) was started in 1970-71 targeting children below 6 years age and expectant and nursing mothers.
- Bal (children) wadi (home or centre) Nutrition Programme is an advanced form of Supplementary nutrition Programme that was started in the year 1970-71.
- The right of the child are: Right to survival, Right to protection, Right for development, and Right to participation.
- The Ministry of Health & Family Welfare is coordinated with Department of Health & Family Welfare, Department of AYUSH, Department of Health Research and Department of AIDS Control.
- Malnutrition, Infectious diseases, Intestinal parasites, Diseases of Skin, Eye and Ear and Dental carries are the major health programmes in school children.
- Elements of school health programmes include the following:
 - o Health-related school policies
 - o Provision of safe and supportive environment
 - o Health, hygiene and nutrition education
 - o School-based health and nutrition services

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- Rashtriya Bal Swasthya Karyakram (RBSK) is a scheme which was targeted to screen children from 0 to 18 years for 4 Ds - Defects at birth, Diseases, Deficiencies and Development Delays including Disabilities.
- The Ministry of Health & Family Welfare under the National Rural Health Mission has launched the Child Health Screening and Early Intervention Services for an organised approach of early identification of diseases and its timely care, support and treatment.
- ‘Continuum of care’ over different phases of the life of a child (particularly the first 18 years) is the salient feature of this programme.
- Reproductive and Child Health (RCH) programme is a comprehensive programme, run by the Government of India’s (GoI) National Health Mission (NHM) in April 2005.
- RCH programme targets to decrease social and geographical inequalities in entree to and deployment of quality reproductive, maternal, newborn, child and adolescent health services.
- Janani Shishu Suraksha Karyakram (JSSK), Janani Suraksha Yojana (JSY) was started on 12 April 2005.
- Rashtriya Kishor Swasthya Karyakram th(RKSK) was started on 7 January 2014.
- The National Rural Health Mission (NRHM) was launched in 2005.
- Creches for Children of Working and Ailing Women was started in 1975 in order to free the working, and unhealthy mothers, from the task of taking after their children during work or illness
- UNICEF IN INDIA provides the following facilities (WASH):
 - o Health particularly Better child health survival & development.
 - o Education
 - o Nutrition
 - o Water and sanitation
 - o Rural development
 - o Urban basic services

14.10 KEY WORDS

- **Body mass index (BMI):** It is defined as weight in kilograms divided by height in metres square (kg/m^2)
- **Kwashiorkor:** It means “the disease which a child gets when the next baby is born” , that is, “it is the sickness of the child who is deposed”

- **Morbidity:** It has been defined as any departure, subjective or objective, from a state of physiological or psychological wellbeing. It includes disease, injury, and disability.
- **Mortality rate:** It is a measure of the frequency of occurrence of death in a defined population during a specified interval.
- **Sex ratio:** It is defined as the number of females per thousand males. It is an important and useful indicator to assess relative excess or deficit of men or women in a given population at that point of time.

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14.11 SELF ASSESSMENT QUESTIONS AND EXERCISES

Short-Answer Questions

1. What are the most common communicable and non-communicable diseases of India?
2. What is the difference between kwashiorkor and marasmus?
3. Write a short note on nutrition surveillance.
4. Write a note on the brief history of NRHM.
5. What are the common health conditions observed in children?
6. What do you understand by mid-day meal programme?
7. What are the main elements of the school health programme?
8. What are the objectives and target beneficiaries of ICDS?

Long-Answer Questions

1. Describe the demand and supply in healthcare.
2. How can you relate nutritional status to the economic development of the country?
3. Discuss the shifts in demand curve and supply curve with appropriate examples.
4. Write a note on various types of measurements done to assess the mortality and morbidity in population
5. How is education important in upliftment of nutritional status of a society?
6. What is the concept of missing women in developing countries?
7. How is gender bias responsible for declining the growth of a nation?

14.12 FURTHER READINGS

NOTES

Manay, Shakuntala N and Sadajsgarswamy. 2011. *Foods: Facts and Principles*. New Delhi: New Age International.

Ali, Mohamad. 1977. *Food and Nutrition in India*. New Delhi: K.B. Publications.

Roday, Sunetra. 2012. *Food Science and Nutrition, 2nd ed*. New Delhi: OUP India.

Rao, Vidya and D.B. Rao. 2010. *A Text Book of Nutrition*. New Delhi: Discovery Publishing House.

Website

<http://in.one.un.org/un-priority-areas-in-india/nutrition-and-food-security/>

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