Food Nutrition & Dietetics (834)

(Class XI and XII) (2018-19)

The discipline of nutrition empowers learners to develop an understanding of the concept, principles of nutrition which will enable them to make the best possible choices of food for meeting the nutritional needs of self, family and community at large. It is so designed to help learners understand the concept of food and nutrition security and create an awareness regarding major public health/nutrition problems affecting vulnerable sections of the society and strategies, programmes, policies enacted by the Government for combating these problems. Further the course will focus on study about the concept, scope, need, importance and process of nutrition education. Yet another focus of the discipline is to provide knowledge to learners for nutritional therapy and counseling service for the purpose of disease management. Creating awareness towards food safety and quality control measures, laws and policies is another important focus.

The syllabus will help learners develop knowledge and skills in this area. This would make them competent to meet challenges of becoming a responsible citizen and effective nutrition educator. The objectives of the course are to:

Objectives:

The syllabus of nutrition at Senior Secondary level develops an understanding in the learners that the knowledge and skills acquired through the study of nutrition facilitates development of good health and well being for self, family and community. It endeavors to –

- Acquaint learners with the basics of food, nutrition, health, fitness. and food safety and quality control,
- Sensitize learners to the common nutritional disorders effecting vulnerable groups in our country and strategies to manage them,
- Impart knowledge of nutrition and lifestyles to enable prevention and management of diseases.
- Develop skills of communication to assist in advocacy and dissemination of knowledge to community.
- Enable learners to become alert and aware consumers, and
- Inculcate healthy food habits.

CLASS XI (2018 – 19)
Food Nutrition & Dietetics (834)

Unit 1: Food and Nutrition: Basic Concepts

- Food, Nutrition, Health, Fitness, Primary Health Care and Nutritional Status (Definition, Inter relationship in maintaining good health and well being)
- Food (Functions and Constituents of food –Nutrient and Food Groups : Basic concepts
- Nutrients: Functions, Sources, Digestion, Absorption, Utilization and Requirements
- Recommended Dietary allowances and RDA for Indians (ICMR 2010) and their uses in planning diets.
- Concepts of meal planning, factors affecting meal planning, and Balanced diet (concept and guidelines in planning balanced diets)

Unit 2: Nutrition through the Life Cycle

- **Nutrition during Infancy (0-1years) and Preschool years (1-6 years):** Infancy, preschool period (critical from Growth, development view point, nutrient requirements- Infant and Young \Child Feeding practices, planning balanced diet for infants, preschoolers and special considerations for feeding young children.
- **Nutrition during Childhood and Adolescent**: Growth, Development, Nutrient needs, meeting nutrient needs through planning balanced diets, packed lunches factors influencing food and nutrient needs during adolescence (peer pressure,body image,media, stress,fasting)
- **Nutrition during Adulthood and Old Age**: Factors influencing nutrient requirements(age, gender,activity level-sedentary, moderate, heavy) Nutrient needs(RDA) and meeting requirement by planning balanced diets.
- **Nutrition during pregnancy and lactation**: Understanding why pregnancy and lactation are critical from nutritional point of view, recommended dietary allowances and planning balanced diets.Special considerations in pregnancy-nausea,vomiting,heart burn,constipation)

Unit 3: Public Health and Nutrition: Basic Concept

- Human Development Index (HDI), Sustainable Developmental Goals (SDG) : Basic Concepts
- Malnutrition (Undernutrition/Overnutrition): Concept/definition, causes (conceptual framework by UNICEF)), consequences
- Methods for assessment of nutritional status (Direct methods –Anthropometry, Biochemical, Clinical, Dietary survey: Basic concept)

Unit 4: Public Health and Nutrition Disorders

- Major Deficiency Disorders: (PEM in the context of underweight, stunting,wasting, SAM; Nutritional Anaemia with special reference to Iron Deficiency Anaemia; Vitamin A Deficiency (Xeropthalmia); Iodine Deficiency Disorders; Zinc deficiency: Prevalence, Causes, Consequences and its control.
- Other Nutritional Problems: Vitamin B complex deficiencies, vitamin C deficiency, Vitamin D deficiencies.
- Overweight/Obesity: Definition/Classification (WHO), Causes and Consequences.
- Non Communicable Diseases (Diabetes, CVD, cancer): Concept, Prevalence, Causes (Behavioural) and Consequences

Unit 5: Public Health and Nutrition: Programmes and Policies

- National programe for welfare of women & Children :objectives, beneficiaries,functions/components) (ICDS, Midday meals)
- Programmes for welfare of Adolescent girls and Women (Rashtriya Kishore Swasthya Karyakram (RKSK),Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (SABLA), Indira Gandhi Maitritva Sahyog Yogna (IGMSY)

Unit 6: Nutrition Education, Communication and Behaviour Change

- Information, Education and Communication (IEC) for Behaviour Change: Definition, Nutrition Education: Need, Scope and Importance
- Process of nutrition education communication
- Nutrition Communication: Media and Multi-Media combinations: Types (Interpersonal communication: Individual and group approach; Mass Media, Traditional Media)

CLASS XI (2018 –19)
PRACTICAL

1. Identify and selection of rich sources of nutrients (Protein, Iron, Calcium, Vitamin A, Fat, Vitamin C)
2. Study of physical self with reference to assessment of nutritional status:
   a) Age, height, weight, MUAC and compare with Standard/References
   b) Observation of clinical signs / symptoms specific to good health Wellbeing
   c) Record own diet for a day using 24 hour recall
   d) Evaluate qualitatively for adequacy using Food groups and how to improve the same
   e) Record Food practices including food taboos, fasting and special food preparation for adolescent, pregnant/lactating women.
   f) Plan and design supplementary/complementary foods for infants and supplementary foods for preschoolers, highlighting their nutrient contribution.
   g) Preparation of different healthy snacks for an adolescent suitable in her/his context
   h) Study self with reference to physical activity (24 hours).
3. Collect five nutrition/health/hygiene messages from print and electronic media which have influenced one self.

4. Plan and prepare any one print/traditional/electronic media/approach you would use to disseminate nutrition/health/hygiene message to the community members.

5. Visit to any one programme/ institution (Govt. /NGO) for children/maternal nutrition and health well being (ICDS, MDM primary health care.); observation of activities in the programme and report writing.

CLASS XII (2018 – 19)

Food Nutrition & Dietetics (834)

Unit 1: Clinical and Therapeutic Nutrition

***Therapeutic Nutrition*:**

- Introduction to clinical nutrition and therapeutic nutrition,
- Scope of Dietetics/Role of Dietitian in health care

(clinical services, community nutrition/public health, wellness and disease prevention, food service, nutrition health education/communication, nutrition research)

Normal Nutrition and Adaptation to Therapeutic Diets:

- Understand relationship between nutrition and infection (Synergism)
- Types of therapeutic modification of normal diet with respect to- consistency, frequency, foodstuffs, nutrients and methods of cooking (Moist-boiling, pressure cooking, steaming, blanching, poaching and Dry–roasting, toasting, baking methods.) .

Unit 2: Diet in Health and Disease : causes , physiological conditions, clinical symptoms and dietary management of:

- Fever (typhoid, tuberculosis)
- Diarrhea
- Eating disorders (anorexia nervosa, bulimia,binge eating**)**
- Overweight/obesity

Unit 3: Diet in Health and Disease : II

Causes, physiological conditions, clinical symptoms, dietary management of

- Hypertension
- Diabetes
- Jaundice/ Hepatitis
- Celiac disease,Lactose Intolerance, peptic ulcer

Unit 4: Food Safety and Quality Control

- Food Hazards(physical, chemical,biological) Food borne Diseases: Cholera,Typhoid, Salmonellosis) Concept, Causes and preventive measures
- Personal Hygiene
- Food Hygiene and Sanitation and Environmental Sanitation and Safety (Water supply, Waste Disposal) at home level.
- Food Adulteration: Concept/Definition as given by FSSAI, Common adulterants present in foods (cereals, pulses, milk and milk products, fats and oils, sugar, honey, spices and condiments), Ill effect of adulterants (metanil yellow, argemone, kesari dal)on human health common methods for detecting adulteration at home)
- (FSSAI Act 2006)
- Reading and Understanding Food labels with reference to food products
- HFSS Foods and their implications for child health

CLASS XII (2018 –19)
PRACTICAL

1. List five problems faced by self as food consumer in context to food safety. Suggest solutions to overcome the same.

2.
   a) Collect labels of any FIVE food products (oils, packaged food, processed food, raw foods, savoury food.) Study and compare them with mandatory label requirements.

   b) Prepare one food label highlighting the following information:

- Name & trade of the Food product and the List of Ingredient
- Food labelling requirements for declaring Nutritional Information
- Declaration of Veg/Non vegetarian
- Food labelling requirements for declaring Food Additives
- Food labelling requirements – Date of Manufacture or Packing and Best Before or Use By Date
- Food labelling requirements – Declaration of Net Quantity
- Food labelling requirements – Identification of Lot/Code/Batch number
- Food labelling requirements – “Instructions for use”
- Specific Requirements and Manner of Labeling of Infant Milk Substitute and Infant Foods
- Food labelling requirements for edible oils & fats, permitted food colors and irradiated food

3. Visit any one food joint (Dhaba/restaurant/school/business centre, etc.) and observe its measure for safe drinking water and general conditions of hygiene around it.

4. Identify food adulteration using common quick tests at household level: using visual and chemical methods; (Milk, Oils and Fats, Sugar and Confectionery, Food grains, Spices and Condiments (Turmeric, Coriander, Black Pepper Seeds etc.), Miscellaneous (artificial colour on green peas, malachite green in green vegetables, white powder in iodized salt, coloured dried tendrils of maize cob in saffron, clay in coffee powder, exhausted tea in tea leaves etc): any five

5. Plan a meal and modify for the physiological condition – Fever, Diarrhea, Constipation, Jaundice, Hypertension, Diabetes. Prepare a dish.
6. Prepare ORS Solution.

Unit 1

Chapter 1: CLINICAL AND THERAPEUTIC NUTRITION

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the terms dietetics, clinical nutrition, therapeutic diet and explain the concept of diet planning in disease,
2. enumerate the scope of dietetics and the role of dietitian in health care,
3. explain the relationship between nutrition and infection,
4. discuss the adaptation of normal diet to therapeutic diets, and
5. describe the types of therapeutic modifications with respect to consistency, frequency of meals, methods of cooking etc,.

Welcome to the study of clinical and therapeutic nutrition. Earlier you were introduced to public health nutrition which you learnt focuses on health promotion and disease prevention in the general population. *Clinical nutrition*, on the other hand, as a study focuses on the nutritional management of individuals or group of individuals with established disease condition. Clinical nutrition deals with issues such as altered nutritional requirements associated with the disease, disease severity and malnutrition and many such issues about which we will learn in this unit and other units in this course. Nutrition is an integral part of the medical therapy as adequate nutrition support can go a long way in improving quality of care and improving patient's medical outcome. The importance of nutrition in the prevention of illness and disease has been long recognized. Do you recall your grandma's homemade remedies for common illnesses such as fevers, cough/cold, stomach ache, and indigestion or heart burn? Yes, nutritional care in terms of providing hot cups of soup or porridge ensured that you were adequately and appropriately nourished which helped improve medical outcome. There is certainly more to clinical nutrition than this. So let us get to know about clinical and therapeutic nutrition.

DIETETICS AND ROLE OF DIETITIAN IN HEALTH CARE

As a student of nutrition it must be evident to you by now that the diet and the food we eat have a direct and significant impact on our health.

Eating a healthy balanced diet improves the quality of our life, whereas a poor diet may lead to morbidity and disease. The branch of medicine concerned with how food and nutrition affects human health comprising the rules to be followed for preventing, relieving or curing disease by diet is called *Dietetics*. Dietetics deals with feeding individuals based on the principles of nutrition. In fact, dietetics is the science and art of human nutritional care.

Clinical Dietetics is the application of dietetics in a hospital or health care institutional setting. Clinical dietetics focuses on individual nutrition support and symptom management. You may come across the terms diet therapy, therapeutic diets while studying about clinical dietetics. Let us get to understand these terminologies used in the context of dietetics.

Diet therapy is a branch of dietetics concerned with the use of food for therapeutic purpose. Diet therapy is a broad term used for the practical application of nutrition as a preventive or corrective treatment of a disease. It concerns with recovery from illness by giving good diet and prevention of disease. It may involve the modification of the existing dietary lifestyle to promote optimum health. For example a dietitian or a nutrition counselor may prescribe a diet therapy to an obese person to improve health. The therapy may involve including foods that improve the health condition while avoiding foods (such as fats, sugars etc.) that may make the condition worse. Basically the therapy promotes a balanced selection of foods vital for good health. The principles of diet therapy are to:

- maintain good nutritional status,
- correct deficiencies or disease, if any,
- provide rest to the body,
- help metabolize the nutrients, and
- make changes in body weight, when necessary.

Diet therapy may include prescribing specialized dietary regimes or meal plans. These specialized diet regimens or meal plans are called therapeutic diets. *Therapeutic diet* refers to a meal plan that controls the intake of certain foods or nutrients. They are adaptation of the

normal, regular diet. Some common examples of therapeutic diets include clear liquid diet, diabetic diet, renal diet, gluten free diet, low fat diet, high fibre diet etc. Therapeutic diets are usually prescribed by dietitians, nutritionists or physicians. We will learn about the types of therapeutic diets later in this unit.

Depending on the nature of the problem, a health care team might include physician/doctor, nurses, nutritionists, dietitians, counselors etc. But dietitian/nutritionists are at the forefront of nutritional care. A nutrition professional can advice, counsel, coordinates, educate, guide, inform, suggest and support. Nutrition professional works with individuals/patients to help them understand that good nutrition and good health go hand-in-hand. The various tasks and the role of dietitian in health care are enumerated next.

Role of Dietitian in Nutrition Care

Dietitian you know is an expert in dietetics, dealing with human nutritional care. A dietitian apply the science and principals of human nutrition to help people understand the relationship between food and health and make appropriate dietary choices to attain and maintain health and to prevent and treat illness and disease.

Dietitians work in a wide variety of roles in, for example, a clinical, public health or community, food service, administrative, freelance/consultancy, research or teaching capacity. However, you will find that majority of dietitians are clinical dietitians working in hospitals, nursing homes and other health care facilities or specialized institutes/units to provide nutritional care to patients with a variety of health conditions, and provide dietary consultations to patients and their families.

The activities most likely to be undertaken by the clinical dietitians would include:

- Collecting, organizing and assessing data relating to health and nutritional status of individuals, groups and communities,
- Review and analyze patients nutritional needs and goals to make appropriate dietary recommendations,
- Develop and implement nutrition care plans and monitor, follow up and evaluate these plans and take corrective measures wherever required,
- Calculate nutritional value of food/meals planned,
- Prescribe therapeutic diets and special nutrition support and feeding regimens,
- Oversee the preparation of special diets, special nutrition formulas for patients who are critically or terminally and require special feeding through oral, enteral or parenteral routes,
- Plan and prepare basic menus and assist in supervising food service personnel in preparing menus and serving of meals,
- Schedule work assignments in the dietary unit to facilitate the effective operation of the

Therapeutic Diets: A Review

Remember, a *therapeutic diet is a qualitative/quantitative modified version of a normal regular diet* which has been tailored to suit the changing nutritional needs of patient/individual and are used to improve specific health/disease condition. It is a planned diet used to supplement the medical or surgical treatment.

Balanced diet is defined as one which contains a variety of foods in such quantities and proportions that the need for energy, proteins, vitamins, minerals, fats and other nutrients is adequately met for maintaining health and well being.

Here you may enquire what a normal regular d
Normal diet, here, refers to a basic, balanced d
meets the need of an individual.

Refer to Figure 1.1 which illustrates routine hospital diets.

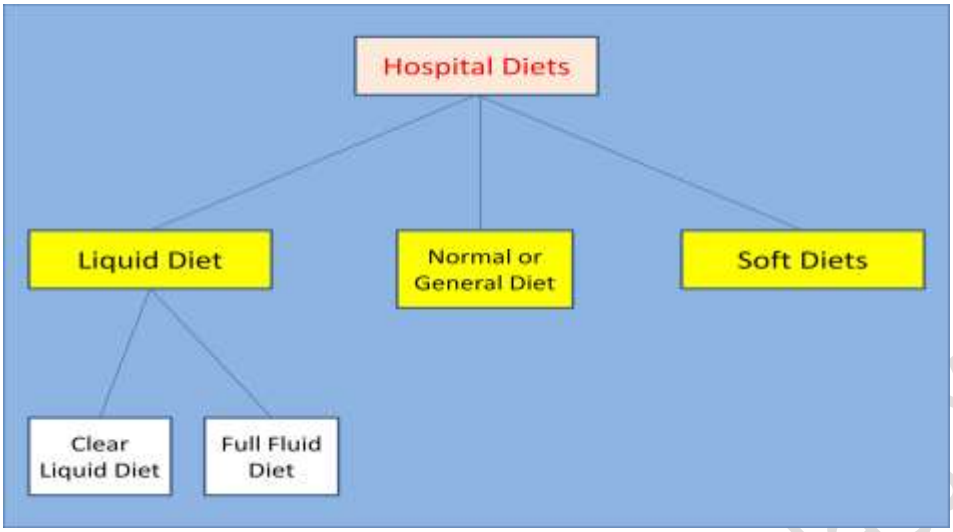


Figure 1.1: Routine hospital diets

Normal or *general diet* in a hospital setting is a balanced diet which meets the nutritional needs of an individual/patient. It is given when the individual's medical condition does not warrant any specific modification. Most hospitals follow simple dietary recommendations (given by ICMR for Indian population) while planning the general diet. It is planned keeping the basic food groups in mind so that optimum amount of all nutrients is provided. Further, since the patient is hospitalized or on bed rest, reduction of 10% in energy intake should be made. The diet provides approximately 1600 to 2200Kcal, and contain around 180 to 300g carbohydrates, 60 to 80g of fat and 40 to 70 g of protein.

Figure 1.1 also illustrates the soft diet and the liquid diets which are examples of therapeutic diet. In addition to these there may be other modified diets which individuals may require as part of their therapeutic needs. The reasons for modifying the diets may include:

- For *essential or life saving treatment*: For example in celiac disease, providing gluten free diet,
- To *replete patients who are malnourished* because of disease such as cancer and intestinal diseases by providing a greater amount of a nutrient such as protein,
- To *correct deficiencies* and *maintain or restore optimum nutritional status*,

- To *provide rest* or relieve an affected organ such as in gastritis,
- To *adjust to the body's ability to digest, absorb, metabolize or excrete*: For example a low fat diet provided in fat malabsorption,
- To *adjust to tolerance of food intake*. For example in case of patients with cancer of esophagus tube feeding is recommended when patients cannot tolerate food by mouth,
- To *exclude foods due to food allergies* or food intolerance,
- To *adjust to mechanical difficulties*, for example for elderly patients with denture problems, changing the texture/consistency of food recommended due to problems with chewing and/or swallowing,
- To *increase or decrease body weight/body composition* when required, for example as in the case of obesity or underweight,
- As *helpful treatment, alternative or complementary* to drugs, as in diabetes or in hypertension

The significance of modified or therapeutic diet is that it is useful in managing the disease condition; it promotes resistance to disease condition and is preventive or supplemental treatment. To help you understand, consider this aspect. When an individual suffers from a disease, the disease process may cause the patient to lose appetite and therefore eat less or in some other circumstances feel more hungry and eat more. Some individuals may have problems with digestion or absorption of food or specific nutrient leading to changes in the type of food which can be tolerated as also the frequency of feeding may need to be altered. Dietary modification than becomes a part of the therapeutic demand. There are many types of dietary modifications. A checklist of some common modifications is presented in the next sub section.

Types of Dietary Adaptations for Therapeutic Needs

A diet may need to be altered and adjusted in many ways before it meets the therapeutic needs of an individual patient. These adaptations may include:

- Change in consistency of foods, such as liquid diet, soft diet, low fibre diet, high fibre diet.
- Increase or decrease in energy value of the diet such as low calorie diet for weight reduction, high calorie diet for burns.
- Increase or decrease in specific nutrients or type of food consumed, such as sodium restricted diet, lactose restricted diet, high fibre diet, high potassium diet.
- Elimination of spices and condiments, such as bland diets.
- Omission of specific foods such as allergy diets, gluten free diet.
- Adjustment in the ratio and balance of proteins, fats and carbohydrate such as diabetic diet, renal diet and cholesterol-lowering diets.
- Test diets: These are single meals or diets lasting one or few days that are given to patients in connection with certain tests e.g. the fat absorption test used to determine if steatorrhoea is present.
- Change in frequency of meals, feeding intervals, re-arrangement of the number and frequency of the meals such as diabetic diet, diet for peptic ulcer disease.

Remember, *normal nutrition is the foundation upon which the therapeutic modifications* are made. The various dietary adaptations for therapeutic needs are briefly highlighted here.

A. Diets of Altered Consistency

Therapeutic diets are modified for consistency, texture to fit the nutritional needs. Some individuals may require a clear liquid diet, while others a fully liquid diet or soft diet based on their medical condition. Figure 1.2 illustrates the modified diets based on consistency.

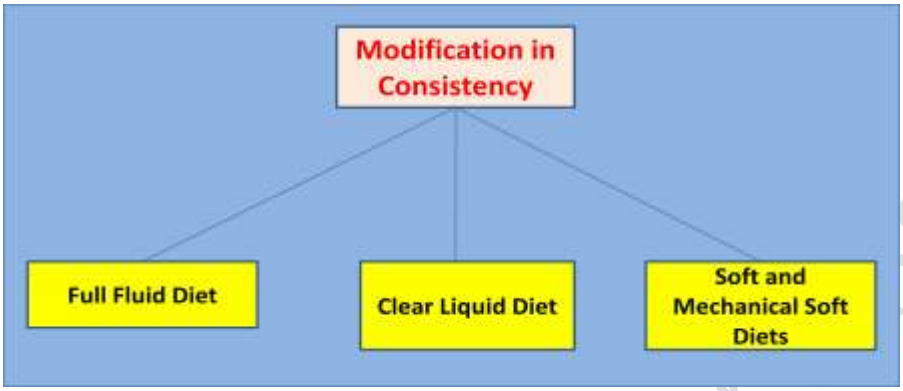


Figure 1.2: Modifications in consistency

a) ***Liquid Diet*** consists of foods that can be served in liquid or strained form in room temperature. They are usually prescribed in febrile states, postoperatively i.e. after surgery when the patient is unable to tolerate solid foods. It is also used for individuals with acute infections or digestive problems, to replace fluids lost by vomiting, diarrhoea. The two major types of liquid diets include - Clear liquid diet and full liquid/fluid diet.

i) Clear liquid diet provides foods and fluids that are clear and liquid at room temperature. The purpose of the clear liquid diet is to provide fluids and electrolytes to prevent dehydration. It provides some amount of energy but very little amount of other nutrients. It is also deficient in fibre. Hence it is nutritionally inadequate and should be used only for short periods i.e. 1-2 days. An average clear liquid diet contains 600 to 900Kcal, 120 to 200g carbohydrate, minimal fat 5 to 10g protein and small amount of sodium and potassium (electrolytes). The clear liquid diet is usually useful in situations when the gastrointestinal tract has to be kept functionally at rest. It is also prescribed before and after certain types of surgery involving the mouth or gastrointestinal tract. Also may be used in acute vomiting or diarrhoea.

Examples of clear liquid diet: Water, strained fruit juices, coconut water, lime juice (nimbu pani), whey water, barley/arrowroot water,

rice kanji, clear dal soup, strained vegetable or meat soup, tea or coffee without milk or cream, carbonated beverages, ice pops, plain gelatin are some examples of clear liquid diet.

ii) Full liquid diet provides food and fluids that are liquid or semi liquid at room temperature. It is used as a step between a clear liquid diet and a regular diet. The purpose of the full liquid diet is to provide an oral (by mouth) source of fluid for individuals who are incapable of chewing, swallowing or digesting solid food. It provides more calories than the clear liquid diet and gives adequate nourishment, except that it is deficient in fibre. It is indicated for post operative patients and for gastrointestinal illness. An average full liquid diet can provide approximately 1000 to 1800 calories and 50 to 65g of protein and adequate minerals and vitamins. The nutritive content of the full liquid diet can be increased by using protein, vitamin and fibre supplements.
Examples of full liquid diet: Foods allowed or included in a full liquid diet include beverages, cream soups, vegetable soups, daal soups, strained food juices, lassi/butter milk, yougurt, hot cocoa, coffee/tea with milk, carbonated beverages, cereal porridges (refined cereals) custard, sherbet, gelatin, puddings, ice cream, eggnog, margarine, butter, cream (added to foods), poached, half boiled egg etc.

b) ***Soft diet*** as the name suggests provides soft whole food that is lightly seasoned and are similar to the regular diet . The term 'soft' refers to the fact that foods included in this type of diet are soft in consistency, easy to chew and made of simple, easily digestible foods. It does not contain harsh fibre or strong flavours. It is given during acute infections, certain gastrointestinal disorders and at the post operative stage to individuals who are in the early phase of recovery following a surgery. The soft diet provides a transition between a liquid and a normal diet i.e. during the period when a patient has to give up a full liquid diet but is yet not able to tolerate a normal diet. Soft diet can be nutritionally adequate (providing approximately 1800-2000 calories, 55-65g protein) provided the patient is able to consume adequate amount of food.

Examples of soft diet: A soft diet freely permits the use of cooked vegetables, soft raw fruits without seeds, broths and all soups, washed pulses in the form of soups and in combination of cereals and vegetables (like khichri, dalia), breads and ready-to-eat cereals (most preferable refined such as poha, upma, pasta, noodles etc.), milk and milk beverages, yogurt, light desserts (including kheer, halwa, custard, jelly, ice cream), Egg and tender and minced, ground, stewed meat and meat products, fat like butter, cream, vegetable oil and salt and sugar in moderation. Foods to be best avoided in the soft diet include coarse cereals, spicy highly seasoned and fried foods, dry fruits and nuts, rich desserts.

Among the soft diet is also the *mechanical soft diet* also known as the dental diet which is a normal diet that is modified only in texture for ease of mastication i.e. chewing. When an individual cannot chew or use facial muscles for a variety of dental, medical or surgical conditions mechanical soft diet is recommended. Elderly persons who have dental problems are prescribed mechanical soft diets. The food in mechanical soft diet is similar to the soft diet and may be full liquid, chopped, pureed or regular food with soft consistency. Simple salads, fruit salads and cottage cheese may be included. No food is restricted unlike in the case of the customary soft diet. Just removing the skin and seeds, cutting or chopping the food into small fine pieces are processes usually employed.

c. ***Bland Diet***: A bland diet is made of foods that are soft, not very spicy and low in fiber. It consists of foods which are mechanically, chemically and thermally non-irritating i.e. are least likely to irritate the gastrointestinal tract. Individuals suffering from gastric or duodenal ulcers, gastriris or ulcerative colitis are prescribed this diet.

Foods Included: Milk and milk products low in fat or fat free; Bread, pasta made from refined cereals, rice; cooked fruits and vegetables without peel and seeds; Eggs and lean tender meat such as fish, poultry that are steamed, baked or grilled; Cream, butter; Puddings and custards, clear soups.

Foods Avoided: Fried, fatty foods; Strong flavoured foods; Strong tea, coffee, alcoholic beverages, condiments and spices; High fiber foods; hot soups and beverages; whole grains rich in fiber; strong cheeses.

B. Modification in Quantity

Depending on the clinical condition some individuals may require a *restriction diet* such as sodium restricted diet (as in high blood pressure), purine restricted diet (as in gout) or low residue diet (prescribed and/or before abdominal surgery) designed to reduce the frequency and volume of fecal output. Sometimes a complete *elimination diet* may be recommended when there is food intolerances or complete insensitivity to a particular food such as a gluten free diet or a dairy free diet or nut free diet etc. Occasionally an *increase in the amount of a specific dietary constituent* may be prescribed such as a high potassium diet or a high fibre diet (as in constipation) or an iron-rich diet (as in anaemia) when the clinical condition demands.

C. Modification in Nutrient (Proteins, Fat, Carbohydrate) **Content**

The nutrient content of the diet is modified to treat deficiencies, change body weight or control diseases such as hypertension or diabetes. You may have come across patients with high blood sugar levels, being prescribed a diabetic diet which requires changes in the quantity and type of carbohydrates included in each meal. Refined carbohydrates (such as sugar, honey, refined flour, semolina etc.) are best avoided and use of complex carbohydrates (whole wheat flour, coarse cereals etc.) recommended. Patients with heart diseases require a fat controlled low cholesterol diet while patients with renal (kidney) failure and advanced liver diseases a low protein diet, patients with HIV disease, cancer or malnourished a high protein, high calorie diet. Others as in the case of overweight, obesity a weight reduction diet, low in fat and calories.

D. Changes in Meal Frequency

Individuals suffering with gastro-esophageal reflux disease (GERD) stand to benefit by consuming small but frequent meals. 5 to 6 small meals instead of three regular meals are recommended.

E. Changes in Method of Cooking

Leaching is indicated for cooking vegetables for people with chronic kidney diseases because the kidney's no longer maintain the ideal

level of potassium necessary for optimum health. Leaching (soaking in water) drains out excessive potassium and phosphorous from the vegetables. In elderly people food may be modified by mechanical processing such as mashing, blendrizing or chopping. For patients on bland diet foods steamed, baked or grilled are recommended. A review on the methods of cooking is presented for your understanding at the end of the book.

F. Modification in the Method of Feeding

To provide adequate nutrition, normally oral feeding (by mouth) is recommended. Sometimes oral feeding is not possible, under such circumstances special feeding methods such as *enteral* feeding (provision of liquid formula diet delivered via nasogastric feeding tube) and *parenteral* feeding (fluids containing water, glucose, amino acids, minerals, vitamins given through the peripheral and central veins) is recommended.

Here we have just introduced to you some common dietary modifications. A detail review on modified therapeutic diets in different disease conditions will be presented later in the units.

Unit 1
Chapter 2: NUTRITION AND INFECTION

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. discuss the interaction between nutrition and infection,
2. describe the effect of infection on nutritional status,
3. discuss how malnutrition can lead to infection,

The role of nutrition in disease prevention and health management is well established. Also you are aware that poor nutrition can lead to ill health, disease and infections. Infections are caused by microorganisms which in turn can lead to malnutrition. Is there a link between these two conditions? In this section we shall discuss the interaction of infection and nutrition.

Infection and malnutrition have always been intricately linked. Evidence suggests that common childhood infections exert their influence in precipitating malnutrition. The relationship between malnutrition, impaired immunity and infection can be described as a vicious cycle. We will learn about this vicious cycle in this unit.

THE CYCLE OF MALNUTRITION AND INFECTION

Malnutrition, as you already know, is an impairment of health resulting from a deficiency or lack of food/nutrients or imbalance of nutrients in the diet. Almost any nutrient

deficiency, if sufficiently severe, will impair resistance to infection. Figure 1 illustrates this concept.

Let us understand this interaction between malnutrition and infection with the help of a case study. Raju, a 4 year old boy, is suffering from infectious diarrhoea, caused by the invasion of the body by harmful microorganisms. The infection caused loose motion, fever, dehydration and impaired absorption. On further investigation he was also found to be suffering from protein energy malnutrition reflecting as loss of weight. Now, when these two diseases exist in the same person (here Raju) concurrently, the interaction between the two diseases usually alters the nature, behaviour of the diseases. The overall clinical status of the child worsens often resulting in increased complications or increased duration of the disease and in some cases results in death. In case of Raju, infection is a common precipitating factor for malnutrition. Ironically, malnutrition is also a major factor in the occurrence of infection and the two interact, making each other worse. Figure 1 illustrates this interaction.

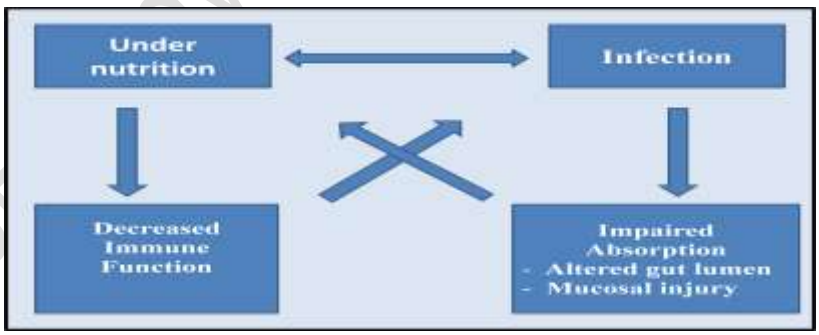


Figure 1: Interaction between infection and malnutrition

An inadequate dietary intake, in case of Raju, led to weight loss, lowered immunity, mucosal injury, invasion by pathogens, and impaired growth and development as highlighted in Figure 2. Raju's nutrition was further

aggravated by diarrhea, malabsorption, loss of appetite, diversion of nutrients for the immune response, and urinary nitrogen loss, all of which lead to nutrient losses and further damage to defense mechanisms making him more susceptible to infections. This in turn led to further reduced dietary intake causing a vicious cycle of malnutrition and infection as highlighted in Figure 1.

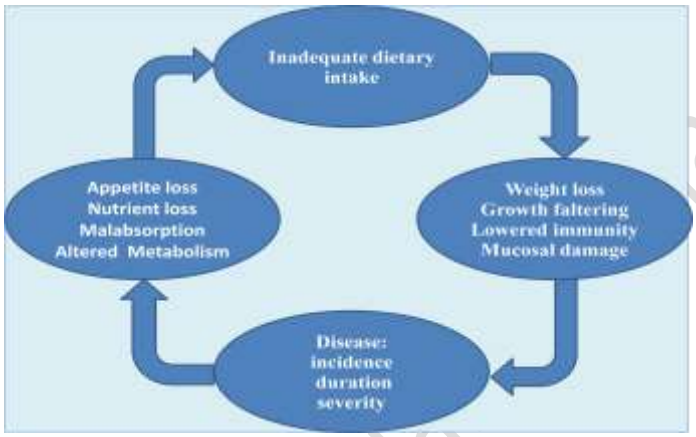


Figure 2: The vicious cycle of malnutrition and infection

So when infection aggravates malnutrition or malnutrition lowers resistance to infection, the relationship between the two can be described as *Synergism* i.e. the simultaneous presence of malnutrition and infection results in an interaction that is more serious for the individual than would be expected from the combined effect of the two working independently.

The synergistic effect of malnutrition and infection often leads to a high rate of child deaths in poor households/communities in India. What generally happens is that in a poor rural/slum household a child is as such born with low birth weight (that is less than 2.5kg) because of inadequate dietary intake of the mother during pregnancy. Subsequently the child is solely breast fed for long periods (2 or more years). Complementary feeding (i.e. introduction of additional foods other than breast

milk) is delayed beyond 6 months of age. This triggers growth faltering that is the child's growth and development slows down resulting in weight loss. In other terms malnutrition sets in. Moreover, in view of the poor environment and lack of hygiene so common in rural/slum areas, the children are further exposed to infections like diarrhoea and respiratory tract infections. There is reduction in food intake by the child due to loss of appetite due to these infections. As a result there is further slowing down of growth. The cumulative effect of dietary deficit and infection produces retardation of physical growth leading to *stunting* (short stature or low height/length for age as compared to normal child) in children. It is important to highlight here that the effects of stunting are long lasting. Children who are stunted grow up to be adults with reduced capacity to do physical work and are less economically productive.

From your understanding of the concept above now can you summarize the effect of malnutrition on infection and the reciprocal relation i.e. the effect of infection on nutritional status? Summarize the points in the space provided:

Now check your responses with the summarized list presented next. The basis of the effect is also described for your understanding

Effect of Malnutrition on Infection

With reference to Figure 1 and 2, it must be evident to you that inadequate nutrient intake lowers immunity. Also it leads to mucosal damage. Let us get to know more on this aspect.

a) *Lowered Immunity*: Immunity, in simple terms can be described as the state of being unsusceptible or being protected against a particular disease or illness by the presence of particular substance in the blood. These particular disease fighting substances are called *antibodies*. A healthy well nourished child/individual is at a lower risk of infection. They can fight the infection better. Why? Because of the ability of these well nourished individuals to produce these disease fighting substances called antibodies. But in case of malnourished individuals there is reduction in antibody production and therefore the disease fighting capacity is lowered making the individual more prone to infections. Hence you would notice that children who are suffering from specific nutrient deficiencies such as protein energy deficiency or iron deficiency anaemia or vitamin A deficiency are prone to infections

b) *Effect on the integrity of skin and mucous membrane*: Dietary inadequacy diminishes resistance to infection by reducing the integrity of various tissues. In a healthy well fed individual the skin, musosal membrane and other tissues are healthy and prevent the entry of infectious agents. They act as a barrier and prevent the infection from entering the body. In an individual suffering from malnutrition, the protective mechanism is absent. The mucous membrane becomes readily permeable and provides a favorable environment for the growth of the infectious agent. Consequently the individual will catch infection easily.

Next let us study about the effect of infection on the nutritional status.

Infection and Nutritional Status

Infection, no matter how mild, has adverse effects on nutritional status. Nutritional status, as you may recall, *refers to the condition of health of an individual as influenced by the utilization of the nutrients*. So how does infection influence the utilization of the nutrients which in turn influences nutritional status? Let us understand. There can be multiple ways but the first and foremost effect of infection is on loss of appetite.

a) *Loss of Appetite*: Do you recall the last time you were sick or down with some infection? What did you experience? Yes, you may not have been eager to consume food or were not able to tolerate food leading to loss of appetite. Further with use of medicines such as antibiotics to treat the infection your appetite may have been further affected leading to reduced food intake. Now if this condition would have been prolonged it would have led to consistent decrease in food intake leading to nutrient deficiency.

b) *Unfavorable cultural practices*: One of the common practices in our country is to restrict or withdraw food from individuals when suffering from infection, particularly diarrhoea or respiratory infections. It is believed that solid foods, milk etc. be best avoided instead bland, starchy gruels low in nutritive value be provided to rest the digestive system. Such a practice is deleterious; particularly when the individual due to infection is already having low food intake and further reduction in the quality of diet contributes to nutrient deficiencies and thus leading to poor nutritional status.

c) *Decreased intestinal absorption*: The main function of intestine is to digest, absorb and propel food along its length. During infection all these functions are affected. Infections

cause's changes to the epithelial membrane leading to malabsorption. Any decrease in the absorption of nutrients can lead to deficiency. For example in children suffering from infectious diarrhoea, protein absorption from intestine may reduce as much as 40%. Other evidence suggests that in children with acute diarrhoea and respiratory infections only 30 -70 per cent of ingested vitamin A is absorbed. Poor absorption thus leads to nutrient deficiency disorders influencing nutritional status.

d) *Worm/parasite infection*: Also there are documented reports implicating intestinal worm/parasitic infections with poor nutritional status. Hookworm, round worm infection, amoebiasis, giardiasis are among the most common intestinal parasitic infections worldwide. These infections are associated with decreased child growth, loss of weight, chronic blood loss, iron deficiency anaemia, diarrhoea and stunted growth.

e) *Protein loss*: In some infections and fevers, few nutrients, particularly proteins are excreted and lost from the body thus causing poor nutritional status. For example diseases associated with diarrhoea, dysentery produce an average loss of 0.9g protein per kg body weight per day. Higher losses are observed with typhoid fever and other acute infections, reaching 1.2g protein/kg body weight/day. Such losses therefore contribute to increased requirement of protein during infection and fevers.

From the discussion above it must be evident to you that the overall effect of the infections on the nutritional status is substantial. In the context of developing country like India, where large number of children, are already on a deficient diet and malnourished, the coexistence of infection in the same

child is producing the effect that is beyond the summed effect expected from the two conditions acting alone.

Unit - 2

Chapter -2: FEVERS

(TYPES, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the term fever and present the classification of fevers
2. differentiate between acute and chronic fevers
3. explain the causes, clinical symptoms and the metabolic changes during infection and fevers, and
4. describe diet therapy during fevers.

In the previous Unit we looked at the interrelationship between nutrition and infections. You would realize that infection and fevers are coexistent. Fever is an outcome of infection. In this section we will also look at the basic concepts and inter-relationship between fever, infection and nutrition. A detail review on dietary management of fevers will be presented.

FEVER: DEFINITION, CAUSES and SYMPTOMS

Fever is classically defined as the abnormal condition of the body, characterized by undue rise in temperature, quickening of the pulse, and disturbance of various body functions. Surely, you must be aware of the normal body temperature. Yes, the normal human body temperature may range from 36^{o}C to 37^{o}C (98.6F). So, technically any body temperature above the normal temperature may be considered fever. What do you think? Well, in practice an individual is usually not considered to have a significant fever until the temperature is above 100.4 (38 C).

It is important to understand that fever is not an illness but it is a symptom or an adaptive response of our body to a variety of conditions, such as infection, inflammation or unknown causes. Fever may be caused by a bacterial infection or by a virus or certain inflammatory conditions such as rheumatoid arthritis (inflammation of the lining of the joints) or a malignant tumor etc.

As a child you may recall suffering from cold/cough and/or chest infection or diarrhoea, and very often these infections were accompanied by fever. The clinical and behavioral manifestations of fever besides elevated temperature you might have experienced included headache, muscle ache, chills and shivering, sweating, loss of appetite, irritability, general weakness, dehydration etc.

Fever is, therefore, a sign that something out of the ordinary is going on in the body. Fever, in fact, is part of the body's own disease-fighting mechanism. A rise in body temperature is one of the ways our immune system attempts to combat an infection Fever helps defend against microbial (bacterial/viral) invasions and apparently is capable of killing or inhibiting the growth of some bacteria/viruses that can tolerate only a narrow temperature range.

From our review so far we may then conclude that usually a rise in temperature helps the individual resolve an infection. So a mild fever i.e. above the normal body temperature but below 100.4F (38 C) is probably helping to neutralize the bacteria or virus that is causing the infection. There is no need to worry. But sometimes fever may rise too high and can be severe and serious and lead to complications. Therefore it is important to learn about the classification, type and pattern of fever for appropriate management.

FEVER: LASSIFICATION AND TYPES

Fevers are primarily classified into three categories: Acute, Sub-acute and Chronic fevers based on duration as highlighted in Figure 3.1.

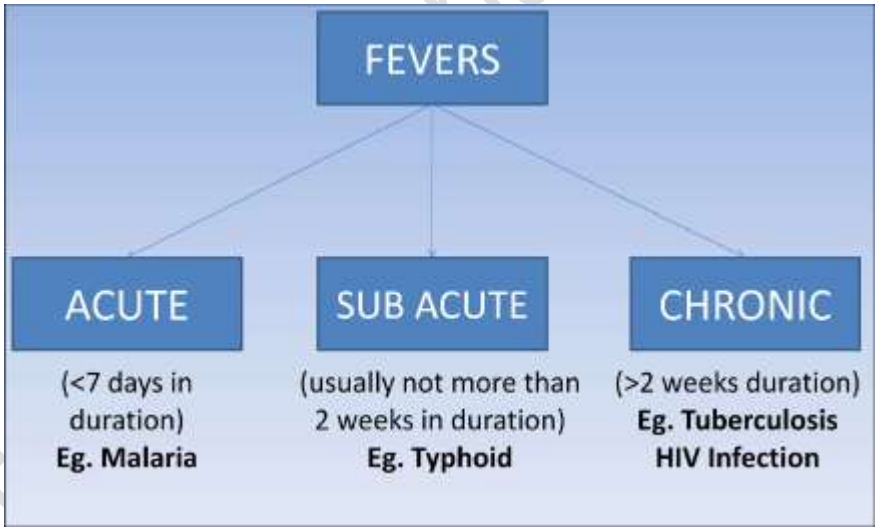


Figure 3.1: Classification of fevers

Acute fevers are those which are for less than 7 days in duration and are characteristics of infectious diseases such as malaria and viral-related upper respiratory tract infections. *Sub-acute fevers* are usually not more than 2 weeks in duration as can be seen in cases of typhoid fever. *Chronic fever* on the other hand are persistent, usually more than 2 we k in duration

and are typical of chronic bacterial infections such as tuberculosis, viral infections like HIV, cancers etc.

Further, based on the height of the body temperature, fevers can also be classified as *low grade, moderate grade or high grade* fever. You would notice that a low grade fever does not exceed 37.8^0C and is present daily especially in the evening. Tuberculosis causes low grade fever. Similarly you may come across fever types described as *continuous or sustained* fever, *intermittent* fever and *remittent* fever. Continuous/sustained fever is defined as a fever that does not fluctuate more than about 1^oc (1.5F) during 24h, but at no time touched normal. Continuous fevers are seen in pneumonia, typhoid, and urinary tract infection among others. Such fevers are characterized by slow step-wise temperature rise. *Intermittent* fever is defined as fever present only for several hours during the day. This pattern you may notice in malaria, tuberculosis or pyrogenic infections. *Remittent* fever, on the other hand, is defined as fever with daily fluctuations exceeding 2^oC but at no time touched normal. This kind of fever is always associated with infectious diseases such as infective endocarditis, rickettsiae Infection.

Having looked at the different types and classification of fever, we shall focus next on management of fevers, with special reference to dietary management. Diet, you would notice plays an important role in the management of fevers. With the rise in body temperature, (above normal), several metabolic changes occur in the body that increases the nutritional needs. A brief review on these changes is presented next.

METABOLIC CHANGES DURING FEVER

Fever is usually characterized by certain metabolic changes. Higher the temperature, longer the duration of the fever, more is the ill effect. The common effects include:

- Increase in the *basal metabolic rate* (BMR). Note, there is a 13% increase in BMR with every 1^oC rise in body temperature. (or 7% increase with every 1^oF increase in temperature).
- Decreased glycogen stores and decreased stores of adipose (fat) tissue.
- Increased catabolism (breakdown) of proteins, especially in case of typhoid, malaria, tuberculosis fevers. This results in production of excess amount of nitrogenous wastes, which places an additional burden on the kidneys.
- Increased excretion of sodium, potassium, chloride etc. thought sweat, urine, vomiting leading to electrolyte imbalance.
- Accelerated loss of body fluid in the form of excessive sweat and urine formation.
- Loss of appetite which limits the food intake thus leading to weight loss.
- Decrease in the absorption of nutrients like proteins, vitamins, minerals.

Basal Metabolic Rate is defined as the rate at which our body uses energy when we are resting in order to keep the vital body functions (such as breathing, heart beating etc.) going.

The above changes accompanied by headache, muscle ache, chills and shivering, sweating, loss of appetite, irritability, general weakness, dehydration experienced during fever may have a significant effect on the nutritional status of the individual. Thus management of fever becomes critical. In the next section we shall look at the diet therapy for management of Fevers. We shall first consider the dietary management of Typhoid which you learnt earlier is sub-acute fever, followed by dietary therapy for chronic fever such as tuberculosis.

DIETARY MANAGEMENT OF TYPHOID

Typhoid is a serious health threat in the developing world such as India, especially for children. We have already learnt that typhoid is a sub-acute continuous fever which can last for about two week's duration. What is the cause of typhoid? Typhoid is caused by the *Salmonella Typhi* bacteria, and is also called *enteric fever* because the bacteria or infection is found in the intestines.

Typhoid fever spreads through contaminated food and water or occasionally through direct contact with someone who is infected. The mode of spread of this infection is, through *fecal-oral route*. Let us understand the concept of fecal-oral route here. Note, Salmonella typhi is passed in the feces and sometimes in the urine of infected people. The source of infection can be the drinking water or milk or any other food contaminated by intestinal contents (through faeces, urine) of the patient or by flies which transmit the disease. We can also contact the infection if we eat food handled by someone with typhoid fever who has not washed their hands carefully after using the toilet.

A patient with typhoid will usually present with:

- high fever, headache, loss of appetite, nausea and vomiting
- gastrointestinal problems like abdominal pain and either diarrhoea or constipation.
- increased BMR
- massive loss of lean body mass (muscle) due to tissue (protein) breakdown leading to excessive nitrogen loss.
- significant decrease in glycogen and adipose tissue stores because of increased energy expenditure.
- excessive diarrhoea, vomiting leading to fluid and electrolyte losses.

It is to be noted that typhoid fever is catabolic in nature, thus in no time it causes weakness and weight loss thus adversely impacting on nutritional status of individual's. Thus diet during typhoid fever needs particular attention. Let's consider the dietary management for typhoid.

Dietary management of Typhoid

The main objective of dietary management during typhoid is to:

i) provide a nutritious diet to prevent malnutrition.

ii) restore positive *nitrogen balance* and reduce the burden on kidneys

iii) provide relief to symptoms as and when present.

iv) correct and maintain water and electrolyte balance, and

v) avoid irritation of intestinal tract as may occur in typhoid.

Thus the dietary management will focus on providing a diet that contains high calories, proteins, carbohydrates and moderate fat. But very often the typhoid fever is accompanied by anorexia, vomiting, nausea. You would notice the patient has poor appetite moreover is unable to tolerate food. So, the diet has to be modified as per the patients' tolerance. The texture of foods given would depend on the patient's tolerance. Initially a *liquid or full fluid diet* may be provided for few days. As the person's appetite improves a *bland diet, low fibre soft diet* may be given which is soothing and easy to digest. Slowly the person may be put on a normal diet. The idea is to encourage the patient to eat so as to meet the increased nutrient requirements. Feedings several times a day need to be encouraged. The nutrient needs during typhoid and how to meet them is the focus of discussion next. The information is summarized in Table 1.

Table 1: Dietary considerations and nutritional needs during typhoid

Dietary requirements	Recommendation/Justification	Dietary Considerations
Energy (Kcal) (Carbohydrates and Fats) A high calorie diet. Approx. 10-20% increase above the normal requirements.	High calorie diet prevents: -the weight loss that takes place due to typhoid fever - compensates for increased BMR, and - replenish the depleted glycogen, adipose stores of the body.	Include *high carbohydrate and moderate fat i*n the diet. Well cooked, easily digestible carbohydrates like glucose, honey, cane sugar, simple starches (unrefined cereals and their products like boiled rice, khichri, pasta, white bread, semolina kheer (suji), custard etc.) boiled potatoes, banana etc. should be included as they require much less digestion and are well assimilated. Emulsified form of fats like cream, butter, fat in milk, egg yolk should be included, as they are easily digested and well tolerated by patients. Fats help in increasing the

		energy density of the food without increasing the bulk of the diet.
Proteins (g) A high protein diet: 1.5 to 2g of protein/kg body weight/day.	High protein diet compensates for: -massive loss of lean body mass (muscle) due to tissue (protein) breakdown leading to excessive nitrogen loss.	Good quantity and good quality protein (of high biological value) in the form of yogurt, eggs, tender meats, fish, and poultry should be incorporated in liberal amounts. Vegetarians can eat dehusked pulses, legumes and cottage cheese that are high in protein content. Use of protein supplements is recommended to add on to the nutrient density without increasing the bulk of the diet.
Vitamins (B Complex vitamins, Vitamin A and Vitamin C)	Vitamins need to be emphasized considering: - the increase in the energy requirements, - a decreased ability of the intestine to assimilate and synthesize some of the B complex vitamin due to compromised digestive processes and altered microbial flora, - to boost immunity and favour wound healing, particularly vitamin C, and -for maintenance of epithelial mucosa (gut lining) vitamin A is required.	Vitamin supplementation may be given in the early stages of the infection when the patient is anorexic and has low food tolerance. Subsequently well cooked soft and pureed yellow and orange coloured fruits and vegetables such as pumpkin, carrots, mango, papaya, bottle gourd etc. may be included Food preparations in forms like juices, stews, soups and dal water are beneficial.
Minerals (Sodium, Potassium, chloride and iron)	-To compensate for loss of electrolytes observed due to diarrhea, vomiting To compensate for iron (blood) loss due to hemorrhage in the intestines	Liberalizing on sodium intake through salty soups, beverages are desired. Potassium intake can be increased by emphasizing cooked fruits, low fibre vegetables, washed and dehusked pulses. Iron rich foods including tender meat and meat products, dehusked pulses may help meet iron needs.
Dietary Fibre	Avoid high fibre foods: -as these foods distress the digestive system and are mechanical irritants	Avoid Intake of whole grain cereals and their products like oatmeal, whole wheat bread, whole pulses and pulses with husk, green leafy vegetables and raw vegetables, fruits with hard skin in the form of salads

		as they are rich in fiber. Include low fibre foods such as refined cereals and their products, dehusked pulses, well cooked fruits, vegetables in soft and puree form and potatoes.
Fluids (Daily fluid intake of 2.5-5 litres)	Liberal fluids intake is desired to: -compensate for the fluid losses in the body through skin and sweat -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance	Fluid intake can be accomplished through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water.
Consistency of diet	Progressive diet needs to be followed:	-In the beginning a *full fluid diet* (rich in calories and proteins) may be provided. -As the appetite improves bland readily digested food needs to be given. -As soon as the fever comes down, a low fibre, soft diet, which is easily digested and absorbed should be givent. Well cooked, well mashed, sieved, bland, semisolid foods like khichdi, rice with curd, suji kheer, custard etc. may be given. Note: Small quantities of food at 2-3 hours interval will provide adequate nutrition without overtaxing the digestives system at any one time.

Following the dietary considerations highlighted in Table 1, we hope you should be in a position to plan a diet for a typhoid patient. Here is a small activity for you. Look at Activity 1. Apply the knowledge you have gained so far and complete the exercise. Do's and Don'ts, and a list of what foods to give and what foods to avoid are also highlighted herewith. You may consult the list while planning the diet. For your reference a case study in also presented in Box 1.

Activity 1: Meeta is a 12 year old girl suffering from Typhoid. Calculate her nutrient requirements and plan a diet for her keeping the dietary considerations in mind. Write your activity in a separate sheet and submit for assessment.

Table 2: Foods to include and foods to avoid in the diet of the typhoid patient

Foods to include	Foods to avoid
1. Plenty of fluids like juices, soups, coconut water, electrolyte, barley water, soups. 2. Milk and milk based beverages. 3. Bland, well cooked, well mashed, sieved, soft, semisolid foods like khichdi, rice with curd, suji kheer, custard etc. 4. Low fibre foods such as refined cereals and their products (e.g. maida, rava, bread, rice, noodles etc.) dehusked pulses (washed dals), well cooked/stewed fruits, vegetables in soft and puree form and potatoes. 5. Foods providing proteins of high biologic value e.g. eggs, soft cheeses, tender meats, fish, poultry etc. 6. Plain gelatin based desserts, sugars, honey,candy and jam.	1. High fibre foods like whole grain cereals and their products e.g. whole wheat flour, whole wheat bread, oats and cracked wheat, whole pulses and pulses with husk. 2. All raw vegetables and fruits with hard skin or fibre such as green leafy vegetables. 3. Strongly flavoured vegetables like cabbage, capsicum, turnip, raddish, onion and garlic as they cause gas, bloating. 4. Thick creamy soups 5. Fried fatty foods such as samosas, pakoras, puri, paratha etc. 6. Sweet concentrated foods using excessive whole milk and dairy fat including halwas, ladoos, pasteries, desserts etc. 7. Acidic and spicy food such as pickles, relishes, chutneys, sauces, vinegar as they may irritate the intestine. 8. Spices, condiments and seasonings like pepper, cayenne and chilli powder to ensure that the digestive tract does not inflame all the more

In addition to the list provided in Table 2, some do's and don'ts basic tips are presented in Table 3. Make a note of them.

Table 3: Do's and Don'ts

Do's	Don'ts
1. Always wash vegetables and fruits with clean water before eating. 2. Wash hands frequently, particularly before eating or preparing food and after using the toilet. 3. Drink water that has been boiled, filtered and treated. 4. Consume 3 – 5 liters of fluids in a day in the form of water, fruit juices, tender coconut water and soup. 5. Eat small frequent meals. 6. Make sure the food (meat, fish or vegetables) whatever it is that you are	1. Avoid places that do not maintain hygiene. Avoid foods from street vendors 2. Do not buy open and cut fruits and vegetables from street vendors. 3. Do not eat unwashed or unpeeled fruits and vegetables. 4. Avoid eating large meals to prevent discomfort 5. Avoid excessive use of fat in cooking 6. Avoid eating foods served at room temperature.

eating has been thoroughly cooked and served steaming hot. 7. Make sure to wash	7. Avoid unpasteurized dairy products 8. Avoid using ice made from tap or well water or flavoured ice. 9. Avoid close contact or sharing eating utensils, cups with people who are infected.

We end our study of diet therapy for typhoid here. Next we move on to chronic fevers and their dietary management. Tuberculosis is an example of chronic fever. We will focus on dietary management of tuberculosis.

DIETARY MANAGEMENT OF TUBERCULOSIS

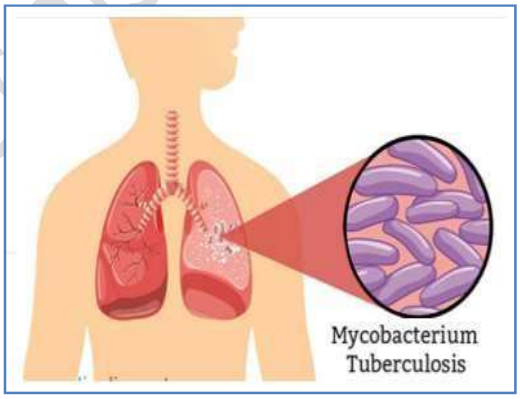
Consider the case of Ramu.

Ramu, a 40 year old factory worker, presented with persistent fever (up to 38^0C) and intermittent cough, sputum, unexplained weight loss and anorexia for 1 month. He visits the doctor who diagnosed his condition as suffering from Tuberculosis. What is tuberculosis?

Tuberculosis (TB), you may be aware, is an chronic infectious disease caused by bacteria - *Mycobacterium tuberculosis*.

The disease spreads from person to person through microscopic droplets released into the air by cough or spit or sneeze from a person with tuberculosis.

Tuberculosis mainly affects the lungs (Figure 1) but can get localized in other organs also, like lymph nodes, kidney, bone etc.



The most commonly observed form of tuberculosis in India is pulmonary tuberculosis. It is worthy to note that tuberculosis remains a major global health problem and is one of the top 10 causes of death and the leading cause from a single infectious agent. It is linked to poverty, undernutrition and poor immune function.

When a person is infected with pulmonary tuberculosis, in a normal healthy individual, the immune system help fights the infection and the bacteria in the body are in an *inactive state* and the person shows no symptom. This is called *latent tuberculosis*. However, if the body's immune system is unable to fight the bacteria the disease becomes *active* and is contagious and can spread in the body and to other people.

The association between TB and undernutrition has long been known. TB makes undernutrition worse and undernutrition weakens immunity, thereby increasing the likelihood that latent TB will develop into active disease.

The common symptom with active TB in individuals is that they:

- are in a catabolic (breakdown of protein/body tissue) state leading to muscle wasting,
- experience weight loss,
- have fever, fatigue, exhaustion and persistent coughing,
- show signs of vitamin and mineral deficiencies, and
- have low body mass index (BMI) (lower than 18.5 kg/m2).

Why do you think weight loss occurs among those with TB? Weight loss can be caused by several factors, including:

- reduced food intake due to loss of appetite, nausea and abdominal pain;
- loss of protein and other nutritional reserves due to fever ,
- malabsorption due to diarrhoea,
- loss of fluids, electrolytes
- metabolic alterations caused by the disease, and
- an increase in the energy expenditure of the patient in an attempt to fight infection

The progression of the disease may be slow gradual but can lead to serious consequences. The key to treatment, therefore, is early detection, followed by antibiotic therapy, adequate rest and diet management. Children with TB, in particular, need special attention since the child has increased requirements as a result of both growth and TB. Let us study the dietary management next.

Dietary Management of tuberculosis

As undernutrition is highly prevalent among people with TB, the dietary recommendations for TB patients are based on the nutrient and energy requirements for hyper catabolic and undernourished patients. The main objective of diet therapy is to prevent weight loss, strengthen the immune system and accelerate recovery. An adequate diet containing all essential nutrients namely carbohydrates, fats, proteins, minerals and vitamins is necessary

for the well being and health of the TB patient. The dietary recommendations and nutritional care and support for TB patients are highlighted in Table 4.

Table 4: Dietary considerations for tuberculosis

Dietary requirements	Recommendation/Justification	Dietary Considerations
Energy (Kcal) (Carbohydrates and Fats) Calorie intake increased by 300 - 500Kcal/day above the normal requirements.	High calorie diet helps: - to minimize weight loss - compensates for increased BMR, and - replenish the depleted nutrient reserves of the body.	Include *high carbohydrate and moderate fat i*n the diet. Diet should provide approximately 25–35% of energy as fat and 45–65% as carbohydrate Include energy-rich foods such as: - Whole grain cereals (wheat, rice, maize etc.), millets. - Vegetable oils (coconut, soyabean, mustard oil) and dairy fat like ghee, butter - Nuts (groundnuts, almond, cashewnuts etc.) and oil seeds - Sugar, jaggery Oils and fats help in increasing the energy density of the food without increasing the bulk of the diet.
Proteins (g) A high protein diet: 1.5g of protein/kg body weight/day from the usual 1g protein/kg body weight.	High protein diet compensates for: -massive loss of lean body mass (muscle) due to tissue (protein) breakdown leading to excessive nitrogen loss.	Good quantity and good quality protein (of high biological value) should be incorporated in liberal amounts in the form of: - milk and milk products (yogurt, soft cheese etc.) - eggs, tender meats, fish, and poultry. - Pulses, soya, nuts and some oilseeds Use of protein supplements is recommended to add on to the nutrient density without increasing the bulk of the diet. For vegetarians, combinations of cereal with pulses for improving the protein quality may be opted for. All meals should have cereal pulse combination with some animal protein, e.g., khichadi with curd, daliya with milk, missi roti with curd, egg with roti/rice etc.

Vitamins (B Complex vitamins, Vitamin A and Vitamin C)	Vitamins need to be emphasized considering: - the increase in the energy requirements, - a decreased ability of the intestine to assimilate and synthesize some of the B complex vitamin due to compromised digestive processes and altered microbial flora, - to boost immunity and favour wound healing, particularly vitamin C, and -for maintenance of epithelial mucosa (gut lining) vitamin A is required.	Vitamin supplementation may be given in the early stages of the infection when the patient is anorexic and has low food tolerance. Green leafy vegetables, yellow and orange coloured fruits and vegetables such as pumpkin, carrots, mango, papaya etc may be included Vitamin C rich food sources like amla, guava, drumsticks, cabbage, capsicum and citrus juice should be included liberally.
Minerals (Calcium, iron, zinc)	- To help heal the tuberculosis lesions - To compensate for iron (blood) loss due to hemorrhage or expectoration - To boost the immune system	Foods rich in calcium such as milk and milk products, pulses, beans, green leafy vegetables, nuts and oilseeds should be included. Intake of 500ml to 1 litre of milk is recommended (in different forms which can be well tolerated by the patient) to meet calcium needs. Calcium supplements with active form of Vitamin D may be needed. Iron rich foods including eggs, meat, poultry, fish, pulses, green leafy vegetables may help meet iron needs. Supplementation with iron is recommended in case blood haemoglobin levels are low.
Dietary Fibre	Restrict high fibre foods: -as these foods distress the digestive system and are mechanical irritants	Food options should be easy to digest and well tolerated.
Fluids (Daily fluid intake 10-12 glasses per day)	Liberal fluids intake is desired to: -compensate for the fluid losses in the body through skin and sweat -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance .	Fluid intake can be accomplished through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water.

Consistency of diet	Progressive diet needs to be followed:	-In the beginning, during acute phase, a *full fluid diet* (high calorie, high protein) is to be provided. - During chronic phase, as the patient improves, the diet is progressed to *semi-solid and then solid diet*. Note: Small frequent meals should be given throughout the day so as to provide adequate nutrition without overtaxing the digestives system at any one time.

Here are some recommendations on how to monitor weight gain in TB patients, particularly in children:

- Encourage the individual to eat healthy, nourishing balanced diet.
- TB often adversely affects nutritional intake due to poor appetite, making patients at risk for malnutrition. Encourage patients to consume six smaller meals per day instead of three.
- Make the meals appetizing in appearance and taste and provide enough energy and protein.
- Commercially-available high energy and protein drinks (balanced in terms of micro- and macronutrients) may be used effectively to meet the increased requirements.
- Household ingredients such as sugar, vegetable oil, peanut butter, eggs and non-fat dry milk powder can be used in porridge, soups, gravies, milk based-drinks to increase the protein and energy content without adding to the bulk of the meal.
- At least 500ml to 1litre milk (or milk product like yoghurt t, soft cheese) should be consumed daily to ensure adequate intakes of vitamin D and calcium.
- Ensure consumption of at least five to six portions of fruit and vegetables per day. Pure fruit juice can be used to decrease the bulk of the diet.
- Provide adequate fluid intake (at least 10 to 12 glasses per day) to compensate for increased losses
- Provide a good multivitamin and mineral supplement.
- Ensure safe food handling and personal hygiene.

Now, can you now summarize the dietary recommendation for a TB patient? Prepare a list of foods you may included liberally or restrict/avoid in the diet of a TB patient. Done? So now match your answer with the list of foods included in Table 7.

Table 2: Foods to include and to be restricted/ avoided in the diet of tuberculosis patient

Foods to include	Foods to avoid
➢ Cereals and millets (wheat, rice, Ragi, jowar etc.) ➢ Pulses (black channa, rajmah, soyabean etc.). ➢ High energy, protein drinks and beverages ➢ Foods providing proteins of high biologic value e.g. eggs, soft cheeses, tender meats, fish, poultry etc. ➢ Cereal pulse combination with some animal protein, e.g., khichadi with curd, daliya with milk, missi roti with curd, egg with roti/rice etc ➢ Nuts and oilseeds like peanuts. ➢ Seasonal fruits and vegetables ➢ Green leafy vegetables like methi, chaulai, shepu, mayalu, mint, spinach, cabbage, drumstick leaves, colocasia and cauliflower greens ➢ Citrus fruits (guava, amla, capsicum). ➢ Milk and milk products ➢ Vegetable oils (coconut, soyabean, mustard oil) and dairy fat like ghee, butter ➢ Jaggery, sugar.	➢ Red meat and organ meats (liver, kidney, brain) ➢ Limit refined foods like refined flour as they provide empty calorie and are devoid of nutrients ➢ Strongly flavoured vegetables like cabbage, capsicum, turnip, raddish, onion and garlic as they cause gas, bloating. ➢ Excess fat ➢ Fried fatty foods/preparations such as samosas, pakoras, puri, paratha etc. ➢ Sweet concentrated foods using excessive whole milk and fat including halwas, ladoos, pasteries, desserts etc. ➢ Acidic and spicy food such as pickles, relishes, chutneys, sauces, vinegar as they may irritate the intestine. ➢ Spices, condiments and seasonings like pepper, cayenne and chilli powder to ensure that the digestive tract does not inflame all the more

We end the dietary management of TB patients with some Do\s and Don’ts.

Table 3: Do’s and Don’ts

Do’s	Don’ts
1. Always wash vegetables and fruits with clean water before serving. 2. Wash hands frequently, particularly before eating or preparing food 3. Give plenty of fluids (10-12 glass/day) and electrolytes to	1. Do not serve large meals to prevent discomfort 2. Do not use excessive fat in cooking 3. Consumption of tobacco in any form avoided 4. Consumption of alcohol to be avoided.

compensate for losses. 4. Provide six frequent meals per day instead of usual three 5. Include 5-6 portion of fruits and vegetables in the diet each day 6. Include meals which are appetizing in appearance and taste 7. Include food options which are easy to digest and well tolerated 8. Provide a good multivitamin and mineral supplement	5. Caffeine, tea consumption avoided as they inhibit absorption of iron 6. Avoid close contact or sharing eating utensils, cups with people who are infected.

Prof. Deeksha Kapur, Discipline of Nutritional Sciences, SOCE, IGNOU, New Delhi

Unit - 2

OBESITY (DEFINITION, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the term overweight and obesity
2. explain the causes, clinical symptoms, metabolic changes and consequences of obesity,
3. discuss the general strategies for obesity prevention, and
4. describe the dietary management of obesity.

Obesity is fast becoming a major public health problem in our country. A dramatic increase in the prevalence of overweight and obesity among all the age groups has occurred in the last 2-3 decades. Recent evidence suggests that about 25-30% of urban Indian adults (male, female) are either overweight or obese, with overall rural, urban combined prevalence of 20%. In metro cities the prevalence of childhood overweight is already in the range of 15-25% and in middle level cities, the range varies from 5-15%. Overweight and obese individuals are at an enhanced risk of ill health leading to diabetes, hypertension and other heart diseases, cancer and psycho-social problems. In this Unit we will define obesity and consider the causes and consequences of obesity. A focused review on dietary management of obesity is presented

WHAT IS OBESITY?

World Health Organization (WHO) defines *Overweight and Obesity as a condition of abnormal or excessive fat accumulation that presents a risk to health.*

So any individual with more than 120% of ideal body weight may be considered as overweight. The ideal body weight (IBW) can be calculated by the formula:

IBW = (height in cm -100) × 0.9

A simple measure, however, commonly used to classify overweight and obesity across all ages is BMI (Body Mass Index). BMI is defined as person's weight in kilograms divided by the square of his/her height in meters (kg/m^2).

[BMI = Weight (kg)/Height (m) ^{2}]

Overweight, Obesity among Adults

BMI is considered to be the most useful population-level measure of obesity, as it is the same for both sexes and all ages of adults. The BMI based classification for adults (both International and for Asian population) is given in Table 5.1. As you may have noticed that WHO defines overweight and obesity as follows:

- overweight is a BMI greater than or equal to 25; and
- obesity is a BMI greater than or equal to 30.

But, for *Indian population*, BMI between 18.5 and 23 is considered normal, since they tend to have higher percentage body fat even at lower BMI as compared to the European population. BMI greater than or equal to 23 is considered overweight/obese for Indian adult as indicated in Table 5.1.

Table 5.1: BMI categories for adults (WHO)

Body Mass Index (BMI)		
International	**Asian population**	**Class**
<18.5 kg/m^2	<18.5 kg/m^2	Underweight
18.5-24.99 kg/ m^2	18.5-22.9 kg/ m^2	Normal weight
25-29.99 kg/ m^2	23.0-24.9 kg/ m^2	Overweight
> 30 kg/ m^2	>25 kg/ m^2	Obese

Note, the BMI classification presented in Table 5.1 is specific to adult population only. You can use this classification to categorize adults into different grades of malnutrition. First calculate the BMI (based on weight and height) and then check in which class the individual's BMI falls. To illustrate, an Indian female (30 years of age) who weighs 70kg and height is 1.6 meters, BMI calculated is: 70/1.6 ×1.6 = 27.34kg/m^2. As per BMI classification (Asian population in Table 5.1), the individual is obese.

BMI cut-off levels for categorizing overweight and obesity among children and adolescent are different. The BMI classification presented in Table 5.1 is not applicable to children and adolescent. WHO has given the ideal ranges of weight for a given height for children 5-19 years of age. These Tables are useful for categorizing children as normal, under-nourished and overweight or obese. Annexure 1 at the end of the unit presents the Table.

Obesity is defined based on the degree of excess fat. More than a general accumulation, the distribution of fat around the abdomen is now considered more harmful than fat around the hips. Accumulation of fat around the abdomen indicated by higher waist circumference is classified as *central obesity*. Waist circumference of 90cm for men and 80 cm for women classified as central obesity is associated with increased risk of several chronic diseases.

In your study so far you have seen that, obesity has been defined using several anthropometric measures like weight, height, BMI, waist circumference. In addition, skinfold thickness and waist-hip ratio is also used to measure body fatness in adults and children. Table 5.2 summarizes their usage.

Table 5.2: Indirect measures of body fatness (other than BMI)

Measurements	Descriptions
Skinfold thickness (SFT)	Skin fold thickness is being used for estimating the body fat content. This requires special instruments called 'calipers'. Skin folds at different parts of the body (triceps, biceps, sub-scapular, supra-iliac, front thigh and calf) have been used for estimating body fat. Specific equations are used to convert the skin fold thickness into the body fat content. *Advantage:* Relatively simpler, non invasive and apart from the total body fat content, it can also indicate about the body fat distribution.
Waist circumference (WC)	WC is highly sensitive and specific measure of central obesity. Cut off values for adults available as highlighted earlier. *Advantage*: Simple technique *Disadvantage*: For children no Indian data available and not widely used.
Waist hip ratio (WHR)	WHR= Waist circumference / Hip circumference. WHR cut offs available for adult males and females but not for children. WHR of more than 0.9 among men and 0.85 in women are associated with increased risk of several chronic diseases.

WHY SHOULD WE AVOID OBESITY?

Maintaining an ideal body weight is crucial for good health. There is no clear definition of ideal body weight, but body weight for a given height of a person with good health and long lifespan is considered as ideal body weight. Excessive body weight increases the risk of chronic diseases such as heart disease, hypertension, diabetes, certain types of cancers, osteoarthritis etc. Excess body fat broadly affects every organ in the body with multi-organ consequences. Major health consequences have been illustrated in Figure 5.1

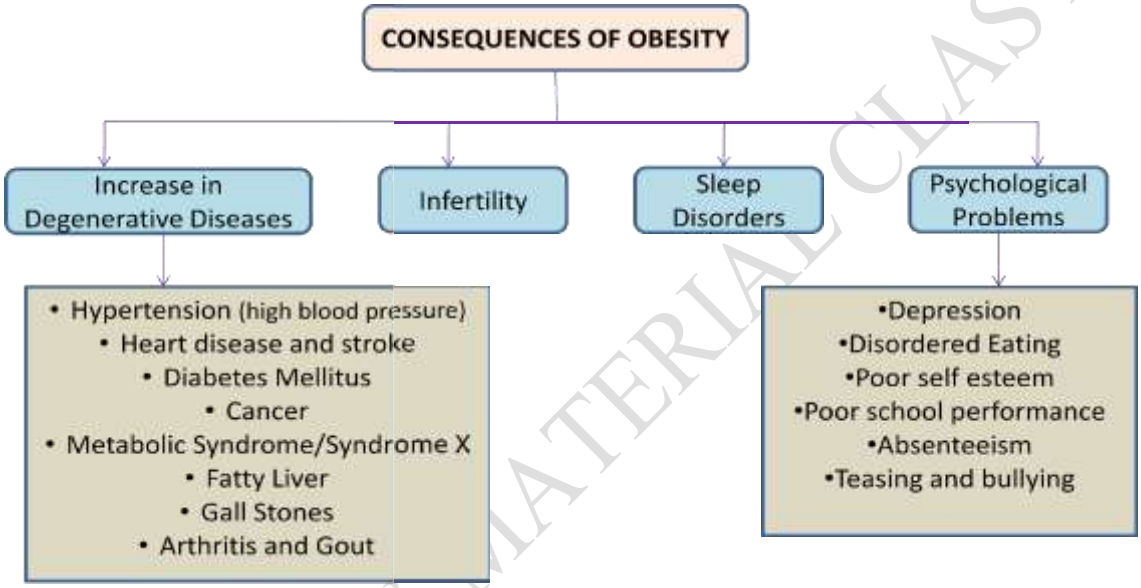


Figure 5.1: Major health consequences of overweight and obesity

Obese children are not only at risk to become obese adults, and consequently suffer from ill health and premature death, but serious complications can also emerge during their childhood. Children with obesity have more risk factors for heart disease like high blood pressure and high cholesterol than their normal weight peers. Children with obesity are also at higher risk for having other chronic health conditions and diseases, such as asthma, sleep apnea, bone and joint problems. Type 2 diabetes is increasingly being reported among children who are overweight. Onset of diabetes in children can lead to heart disease and kidney failure.

Overweight and obese adolescents may also suffer from:

- *depression, low self-esteem*, and *behavioral problems,*
- *stigmatization* (teasing, harassment, and rejection) and bullying behavior by their peers,
- psychological distress manifested by *poor self-image, aggressive* and *negative behavior*, depression, suicide, and
- drug abuse, alcohol and tobacco addiction**.**

In view of the rising obesity prevalence, many of the young children and adolescents have developed 'fear of fatness' and are adopting various dietary and behavioral practices to lose weight and remain thin, even if they have normal BMI. It is more seen in urban areas at this moment. These individuals are at higher risk of developing *eating disorders.*

Apart from health consequences which we discussed above, body fatness has other implications also. These are *economic and academic burden*. It has been estimated that obesity accounts for 2% to 7% of total healthcare costs in developed countries. There are also other costs to consider such as reduced quality of life and productivity loss attributed to decreased work efficiency and medical issues. With regards to academic consequences, among obese adolescents, higher school absenteeism, dropout and lower academic achievement have been seen. But, drawing definite conclusion on this issue is difficult.

Considering the ill effects of obesity it is important that we look at the causes of obesity. The next section focuses on etiology of obesity.

WHAT CAUSES OBESITY?

The etiology of obesity is multi-factorial, as highlighted in Figure 5.2, involving complex interactions among genetic predisposition, individual/family characteristics and behavior and different social and environmental factors. Home, school, neighborhood environment, work place and community also directly influence the eating and physical activity behavior. A marked shift in the dietary patterns as a result of urbanization and affluence has been associated with rising prevalence of obesity in our country.

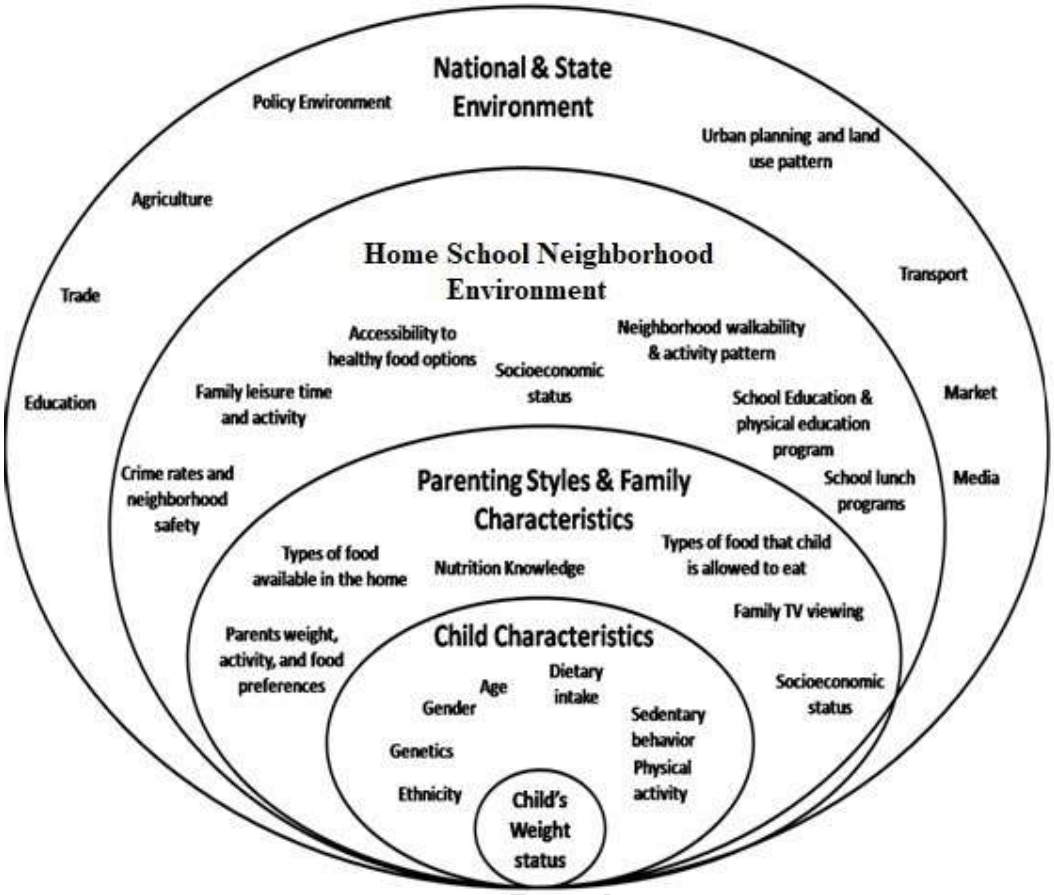


Figure 5.2: The causes and risk factors of obesity

Overweight and obesity, are broadly the result of an imbalance between energy intake (food) and energy expenditure (physical activity and some other metabolic activity). The imbalance might be due to excess energy intake (overeating) or reduced energy expenditure (sedentary lifestyle). The excess of energy consumed is stored in the body in the form of adipose tissue. When food availability is less, it could be seen as a survival mechanism, but when food is abundant and the physical activity level decreases, this results in fat deposition. Table 5.3 lists the key factors that might promote weight gain and obesity.

Table 5.3: Summary of factors that promote weight gain and obesity

- High intake of energy-dense, micronutrient poor foods - Heavy marketing of energy-dense foods and fast food outlets - High intake of sugar-sweetened soft drinks and fruit juices - Sedentary lifestyle - Adverse socio-economic conditions - Large portion sizes - High proportion of food prepared and eaten outside the home - Rigid restraint/periodic disinhibition eating patterns - Alcohol

Source: Joint FAO/WHO Expert Consultation. WHO Technical Report Series 916: Diet, Nutrition and the Prevention of Chronic Diseases. World Health Organization; Geneva, Switzerland: 2003

As highlighted in Table 5.3, increased risk factors include a higher energy density diet with increased intake of fat and added sugars, salt in foods. Eating junk or unhealthy foods coupled with low physical activity (sedentary lifestyle) promotes weight gain. Saturated fat intake (mostly from animal sources), marked increases in animal food consumption, reduced intakes of complex carbohydrates and dietary fiber, and reduced fruit and vegetable intake are other contributing factors. Over-feeding during infancy, childhood and adolescence predisposes to overweight/obesity in adulthood

Further, lack of access to healthy foods as determined by adverse socioeconomic conditions influences the diet and health of a population. Energy-dense and nutrient-poor foods provide daily calories at an affordable cost to the poor groups hence consumed in large portions. On the other hand, the commercial driven food market environment is other probable causes of obesity. The traditional micronutrient-rich foods consumed by children/families are replaced by heavily marketed, sugars-sweetened beverages (i.e. soft drinks) and energy dense fatty, salty and sugar foods (HFSS snacks), contributing to obesity.

The dietary changes highlighted above are compounded by lifestyle changes that reflect reduced physical activity at work/school and during leisure time. Evidence suggests that insufficient physical activity is one of the important risk factors of obesity, and work-related activity has declined over recent decades, whereas, leisure time dominated by television viewing and other physically inactive pastimes has increased, particularly among children.

Considering the multifaceted causes of obesity it is important that appropriate strategies based on improved dietary practices and physical activity for prevention of obesity are considered. The next section focuses on prevention strategies followed by dietary management of obesity.

GENERAL STRATEGIES FOR OBESITY PREVENTION

The prevention of obesity in infants, young children, adolescents and adults should be considered of high priority. There can be no single or simple solution to the increasing prevalence of obesity. It's a complex problem and there has to be a multifaceted approach. Policy makers, state and local governments/organizations, business and community leaders, school, childcare and healthcare professionals, parents and individuals must work together to create an environment that supports a healthy lifestyle.

For infants and young children, the main preventive strategies should focus on:

- the promotion of exclusive breastfeeding;
- avoiding the use of added sugars and starches when feeding formula;
- instructing mothers to accept their child's ability to regulate energy intake rather than feeding until the plate is empty;
- assuring the appropriate micronutrient intake for the child needed to promote optimal growth and development.

For school children and adolescents, prevention of obesity implies the need to:

- promote an active lifestyle;
- limit television viewing;
- promote the intake of fruits and vegetables (at least 5 servings of fruits and vegetables daily)
- restrict the intake of unhealthy, energy-dense, micronutrient-poor foods (e.g. packaged snacks (rich in fat, sugar and salt), refined grains and sweets, potatoes etc);
- restrict the intake of sugars-sweetened soft drinks, sport drinks and fruit juice drinks.
- improving sleep,
- reducing stress

The *home environment* too is another important setting in preventing overweight and obesity. Parents can play a crucial role. Potential areas to target in terms of television viewing, home food and physical activity environment include:

- Purchasing healthy foods,
- Practicing regular meal times,
- Encouraging the children to eat only when hungry and to eat slowly.

- Allocating individual portions of food for children,
- Keep the refrigerator stocked with fat-free or low-fat milk and fresh fruit and vegetables instead of soft drinks and snacks high in sugar and fat.
- Creating opportunities for physical activities,
- Parents as role model. Parents who eat healthy foods and are physically active set an example that increases the likelihood their children will do the same,
- Messages to parents to not having television in children's room and encouraging family rules restricting television viewing.

Children should be encouraged to participate in at least 60 minutes of moderate intensity physical activity, preferably daily in the form of sports and physical activity. Some examples of moderate intensity physical activity may include: brisk walking, skipping (rope jumping), playing soccer, swimming, dancing etc.

In addition to encouraging physical activity, children should avoid too much sedentary time. Parents should limit the time children watch television, play video games, or surf the web to no more than 2 hours per day. Additionally, television viewing for children age 2 or younger may be best avoided. Instead, encourage children to find fun activities to do with family members or on their own that simply involve with more activity.

Preventive measures for adults:

The preventive measures highlighted above may apply to preventing obesity among adults too. Some healthy eating practices and points to consider that may protect against weight gain may include:

- eating five to six servings of vegetables and fruits daily,
- choosing whole grain foods and avoiding highly processed foods made with refined flour, sugar and saturated fat in the diet,
- avoiding foods which are high in 'energy density' or that have lots of calories in a small amount of food,
- decreasing sugar-sweetened beverages

Preventive strategies for adults may also include promotion of small changes in physical activity. A total of 60 min of physical activity is recommended every day for healthy Asian Indians. This should include at least 30 min of moderate-intensity aerobic activity (e.g. brisk

walking, jogging, hiking, bicycling, gardening etc), 15 min of work-related activity e.g. carrying heavy loads, climbing stairs etc.), and 15 min of muscle-strengthening exercises (at least 3-4 times a week). Note inactive people should start slow and gradually increase physical activity.

The *food industry* can play a significant role in promoting healthy diets by:

- reducing the fat, sugar and salt content of processed foods;
- ensuring that healthy and nutritious choices are available and affordable to all consumers;
- restricting marketing of foods high in sugars, salt and fats, especially those foods aimed at children and teenagers; and
- ensuring the availability of healthy food choices and supporting regular physical activity practice in the workplace.

So prevention is always better than cure. Maintaining a desirable body weight by consuming just enough calories or adjust physical activity to maintain energy balance (i.e. intake = output) is critical to prevent and treat obesity. The next focus in this unit is how to maintain energy balance and reduce weight.

DIETARY MANAGEMENT OF OBESITY

A combination of interventions/strategies may be adopted to manage obesity. These include:

a. dietary modification,
b. increase in physical activity and reduction in sedentary lifestyle, and
c. behavior modification

Successful treatment, management of overweight, obesity requires adoption and maintenance of lifestyle behaviors contributing to both dietary intake and physical activity. Role of physical activity in reducing prevalence of obesity has already been highlighted in the section on prevention Here we shall focus on dietary management of obesity.

The objective of diet planning for overweight/obese individual must focus on:

- promoting gradual weight reduction
- preventing muscle loss and other nutritional deficiencies
- helping to maintaining a desirable body weight, and
- bring positive behavioral changes (diet/ life style management)

To meet these objectives the nutrient needs and dietary modifications for overweight, obesity are highlighted in Table 5.4.

Table 5.4: Dietary considerations and nutritional needs for overweight and obesity

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) *For adults*	Weight reduction: *Moderate deficit diet* - 1200- 1500 Kcal/day for women, and - 1500-1800 Kcal/day for men *Low-Calorie diet* - 1000 -1200 Kcal/day for women, and - 1200- 1500 Kcal/day for men	Deficit of 500 Kcal/day will help produce a weight loss of 500g per week Deficit of 750 - 1000 Kcal/day will help produce a weight loss of 1 kg per week - Restrict the intake of high fat, sugar, salt (HFSS) foods. - Avoid foods which are high in 'energy density' or that have lots of calories in a small amount of food.
For older children and adolescent	Adult guidelines may be adopted	
Proteins (g) (15-20% of total calories provided by proteins)	Adequate protein intake (1g/kg body weight) to: -ensure proper metabolism -prevents muscle loss, and -provide a higher satiety (makes the individual feel full).	Emphasis should be laid on the inclusion of protein rich foods from plant origin (pulses, lentils, beans etc.) rather than from animal sources as the former are low in fat but high in dietary fibre. Among animal sources, choose lean meats, poultry, fish.
Carbohydrate (CHO) (50-55% of total calories to be provided by carbohydrates)	CHO are made up of three components - Starch, fibre and sugar. Fibre and starch are complex CHO. Sugar is simple CHO. Complex carbohydrates: - provide bulk and satiety value to reducing diet, and - helpful in bowel movement.	Complex carbohydrates from whole grain cereals and their products like oatmeal, whole wheat bread etc. and pulses with husk; Vegetables (peas, beans), high fibre fruits (preferable raw with their edible peel), may be preferred. -Foods such as potatoes, white breads, noodles, pasta and those made from simple/refined carbohydrates need to be restricted.

		- Sugar, jaggery, sugar candies, cookies, chips, chocolates etc. should be strictly restricted. - Sweet beverages particularly juices, sport drinks, sweetened soft drinks best avoided.
Fats and Oils **(**30% or less of total calories to be provided by total fat)	Dietary fat induces over consumption and weight gain through its: -low satiety properties, and -high caloric density.	-Vegetable oils (mustard, olive, soyabean, corn, sunflower oil) should be given preference. - Butter, cream, pure ghee should be avoided - Foods rich in saturated fats such as red meats, whole milk and its products and nuts/oil seeds should be avoided. -Include low-fat or non-fat milk or dairy products (skimmed milk). - Avoid full- cream milk and other milk products made from full-cream milk. - Fried foods, bakery products should be strictly avoided - Use non-stick cookware/ micro-wave for cooking -Prefer steam/pressure cooking to deep frying.
Vitamins and Minerals (Meet the daily dietary recommended intake)	Despite excess dietary calorie intake, obese individuals: - have high rate of micronutrient deficiencies (namely thiamine, folic acid, vitamin C, Zinc, selenium deficiency) -are at risk of developing deficiency of fat-soluble vitamins (such as Vitamin A, Vitamin D deficiency), Consumption of plenty of fruits and vegetables will help : - maintain adequate micronutrient intake, and - provide satiety	Provide 5-6 servings of vegetables and fruits daily which may include: -raw non-starch vegetables (radish, cucumber etc.) and green leafy vegetables yellow and orange colored fruits/ vegetables, -low-calorie fruits (apple, oranges, pear, guava etc.) preferably with their edible peels. List of Low calorie vegetable and fruits presented in box 1 -Incorporate fermented foods and sprouted pulses / legumes to help in improving the bioavailability of several nutrients. -Use oils fortified with vitamin A/D).
Dietary Fibre **(25- 30g per day)**	Dietary fibre sources help in: -proper bowel function -providing satiety (fullness)	- Consume 5-6 servings of fruits and vegetables daily.

	thus reducing hunger and preventing overeating -Providing micronutrients and phytochemicals that may improve health, and - are less calorie dense and low in fat and sugar	- Include green leafy vegetables and raw vegetables, fruits with hard skin in the form of salads -Include whole grain cereals and their products like oatmeal, whole wheat bread, whole pulses and pulses with husk. -Spoon full of finely ground husk/bran of cereals/pulses in glass of water before meals may be provided as it gives a feeling of satiety
Fluids (Liberal intake)	Liberal fluids intake is desired to: -compensate for the fluid losses in the body through skin and sweat -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance	Fluid intake can be accomplished through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water.

With the guidelines provided in table 5.4, we hope you should be in a position to counsel and plan a diet for an overweight or an obese individual. For your reference the amount of food group one can include in a day's diet is presented in Table 5.5. A sample low calorie diet based on the amounts recommended is also presented in Box 1and 2 later in this Unit.

Table 5.5: Amount of different food groups to be served in a day

Food Groups	Servings(g) for 1200 kcal	Servings(g) for 1500 kcal
Cereal & millets	150	180
Pulses	45	60
Milk & Milk Products	300ml (3% Fat)	400ml (3% Fat)
Roots & Tubers	50	100
Green Leafy vegetables	100	150
Other vegetables	200	300
Fruits	200	300
Sugar	5	10
Fat	15	15

Important counselling tips and foods to give and what foods to avoid are also highlighted in Table 5.6. You may consult the list while planning the diet.

Table 5.6: Foods to include and foods to avoid in the diet of overweight/obese individuals

Foods to include	Foods to avoid
1. Whole grain cereals: Plenty of fluids like juices, soups, coconut water, electrolyte, barley water, soups. 2. Milk and milk based beverages. 3. Bland, well cooked, well mashed, sieved, soft, semisolid foods like khichdi, rice with curd, suji kheer, custard etc. 4. Low fibre foods such as refined cereals and their products (e.g. maida, rava, bread, rice, noodles etc.) dehusked pulses (washed dals), well cooked/stewed fruits, vegetables in soft and puree form and potatoes. 5. Foods providing proteins of high biologic value e.g. eggs, soft cheeses, tender meats, fish, poultry etc. 6. Plain gelatin based desserts, sugars, honey,candy and jam.	1. High fibre foods like whole grain cereals and their products e.g. whole wheat flour, whole wheat bread, oats and cracked wheat, whole pulses and pulses with husk. 2. All raw vegetables and fruits with hard skin or fibre such as green leafy vegetables. 3. Strongly flavoured vegetables like cabbage, capsicum, turnip, raddish, onion and garlic as they cause gas, bloating. 4. Thick creamy soups 5. Fried fatty foods such as samosas, pakoras, puri, paratha etc. 6. Sweet concentrated foods using excessive whole milk and dairy fat including halwas, ladoos, pasteries, desserts etc. 7. Acidic and spicy food such as pickles, relishes, chutneys, sauces, vinegar as they may irritate the intestine. 8. Spices, condiments and seasonings like pepper, cayenne and chilli powder to ensure that the digestive tract does not inflame all the more

In addition to the list provided in Table 5.6, some do's and don'ts are presented in Table 5.7. Make a note of them.

Table 5.7: Do's and Don'ts

Do's	Don'ts
1. Always wash vegetables and fruits with clean water before eating. 2. Wash hands frequently, particularly before eating or preparing food and after using the toilet. 3. Drink water that has been boiled, filtered and treated. 4. Consume 3 – 5 liters of fluids in a day in the form of water, fruit juices, tender coconut water and soup. 5. Eat small frequent meals. 6. Make sure the food (meat, fish or vegetables) whatever it is that you are eating has been thoroughly cooked and served steaming hot. 7. Make sure to wash	1. Avoid places that do not maintain hygiene. Avoid foods from street vendors 2. Do not buy open and cut fruits and vegetables from street vendors. 3. Do not eat unwashed or unpeeled fruits and vegetables. 4. Avoid eating large meals to prevent discomfort 5. Avoid excessive use of fat in cooking 6. Avoid eating foods served at room temperature. 7. Avoid unpasteurized dairy products 8. Avoid using ice made from tap or well water or flavoured ice. 9. Avoid close contact or sharing eating utensils, cups with people who are infected.

Box 1: Sample Menu for 1200 kcal diet

MEAL	MENU	AMOUNT
Early Morning (6:00 - 6:30 am)	Green Tea/Lemon Tea	1 cup
Breakfast (7:30 – 8:00 am)	Veg. Stuffed Chapati or Veg. Oats or Veg. Poha Curd/Toned Milk	2 Chapati/ 2 Katori 100 gms/150 ml
Mid Morning (11.00 – 11.30 am)	Fruit	200 gms
Lunch (1:00 – 1:30 pm)	Salad Multigrain/oats Chapati Vegetables Curd/Raita	50 gms 1.5 1 Katori 100 gms
Evening (4:00 – 4:30 pm)	Sprouted Chaat/ Moth/Boiled Chana Chaat	1 Katori (15 gm Raw Dal)
Dinner (7:00 – 7:30 pm)	Salad Chapati Dal	50 gms 1.5 1 Katori
Post Dinner (8:30 – 9:00 pm)	Toned Milk	100 ml

(Use 3 tsp of Fat/oil and only 1 tsp of sugar in a day. It would be preferable if you drink milk without sugar)

Box 2: Sample Menu for 1500 kcal Diet

MEAL	MENU	AMOUNT
Early Morning (6:00 - 6:30 am)	Green Tea/Lemon Tea	1 cup
Breakfast (7:30 – 8:00 am)	Stuffed Chapati/ Besan Chilla/Veg Oats/Veg Poha Curd	2 Chapati/ 2 Kalori 100 gms
Mid Morning (11.00 – 11.30 am)	Fruit/Fruit Chaat	200 gms
Lunch (1:00 – 1:30 pm)	Salad Multigrain/Bron Chapati Vegetable Curd/Raita	50 gms 2 1 Katori 100 gms
Evening (4:00 – 4:30 pm)	Toned Milk, Fruit Smoothie Sprouted Chaat	150 ml with 80 – 100 g Fruit/ 1 Katori
Dinner (7:00 – 7:30 pm)	Salad Bran Chapati Dal	50 gms 2 1 Katori
Post Dinner (8:30 – 9:00 pm)	Toned Milk	150 ml

(Use 3 tsp of Fat/oil and 2 tsp of Sugar)

Unit Writer: Prof Deeksha Kapur, Discipline of Nutritional Sciences, School of Continuing Education, IGNOU, New Delhi.

Annexure 1

Simplified Field Tables (BMI-for-AGE)

BMI-for-age BOYS 5 to 19 years (z-scores)								
Years	**Months**	**-3 SD**	**-2SD**	**-1SD**	**Median**	**1SD**	**2SD**	**3SD**
5	61	12.1	13.0	14.1	15.3	16.6	18.3	20.2
6	72	12.1	13.0	14.1	15.3	16.8	18.5	20.7
7	84	12.3	13.1	14.2	15.5	17.0	19.0	21.6
8	96	12.4	13.3	14.4	15.7	17.4	19.7	22.8
9	108	12.6	13.5	14.6	16.0	17.9	20.5	24.3
10	120	12.8	13.7	14.9	16.4	18.5	21.4	26.1
11	132	13.1	14.1	15.3	16.9	19.2	22.5	28.0
12	144	13.4	14.5	15.8	17.5	19.9	23.6	30.0
13	156	13.8	14.9	16.4	18.2	20.8	24.8	31.7
14	168	14.3	15.5	17.0	19.0	21.8	25.9	33.1
15	180	14.7	16.0	17.6	19.8	22.7	27.0	34.1
16	192	15.1	16.5	18.2	20.5	23.5	27.9	34.8
17	204	15.4	16.9	18.8	21.1	24.3	28.6	35.2
18	216	15.7	17.3	19.2	21.7	24.9	29.2	35.4
19	228	15.9	17.6	19.6	22.2	25.4	29.7	35.5

BMI-for-age GIRLS 5 to 19 years (z-scores)								
Years	**Months**	**-3 SD**	**-2SD**	**-1SD**	**Median**	**1SD**	**2SD**	**3SD**
5	61	11.8	12.7	13.9	15.2	16.9	18.9	21.3
6	72	11.7	12.7	13.9	15.3	17.0	19.2	22.1
7	84	11.8	12.7	13.9	15.4	17.3	19.8	23.3
8	96	11.9	12.9	14.1	15.7	17.7	20.6	24.8
9	108	12.1	13.1	14.4	16.1	18.3	21.5	26.5
10	120	12.4	13.5	14.8	16.6	19.0	22.6	28.4
11	132	12.7	13.9	15.3	17.2	19.9	23.7	30.2
12	144	13.2	14.4	16.0	18.0	20.8	25.0	31.9
13	156	13.6	14.9	16.6	18.8	21.8	26.2	33.4
14	168	14.0	15.4	17.2	19.6	22.7	27.3	34.7
15	180	14.4	15.9	17.8	20.2	23.5	28.2	35.5
16	192	14.6	16.2	18.2	20.7	24.1	28.9	36.1
17	204	14.7	16.4	18.4	21.0	24.5	29.3	36.3
18	216	14.7	16.4	18.6	21.3	24.8	29.5	36.3
19	228	14.7	16.5	18.7	21.4	25.0	29.7	36.2

WHO Classification	**BMI-for-age (kg/m^2) Z Score**
Obese	Obesity: > +2SD (equivalent to BMI 30 kg/m^2 at 19 years)
Overweight	Overweight: > +1SD (equivalent to BMI 25 kg/m^2 at 19 years)

UNIT 3

CHAPTER-1-DIABETES MELLITUS (DEFINITION, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

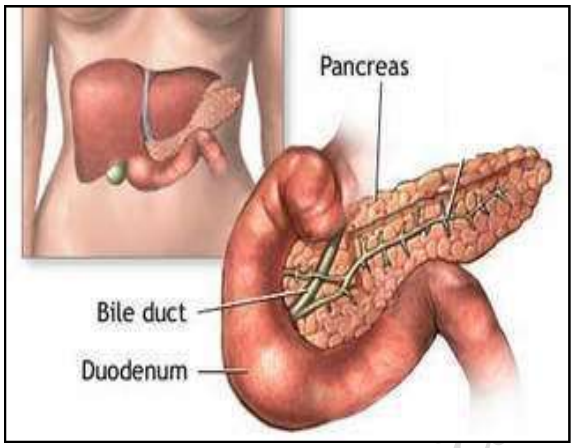
1. define the term diabetes and present the classification of diabetes,
2. explain the causes, clinical symptoms, complications of diabetes, and
3. describe the management of diabetes, with a main focus on diet therapy and dietary management during diabetes.

In your day to day life you may have heard family, friends, and acquaintances complaining of suffering from "*Sugar Problem*" or "*Madhumeh*". Newspaper articles, TV commercials promising simple, home remedies for cure of sugar problem are on the rise. Today, the so called sugar problem or "*diabetes*" has become a major public health problem in our country with recent estimates suggesting 66.8 million people suffer from this condition, the largest number of any country in the world. What is more alarming is the fact that diabetes can strike anyone, from any walk of life – rich, poor, young, old - and nearly half of the population with diabetes remains undetected, leading to complications. The rising burden of Diabetes has greatly affected the quality of life of people, the health care sector and the economy of our country. Faulty dietary practices, sedentary lifestyle and increased urbanization has further aggravated the problem. In this Unit we will consider the risk factors, symptoms and complications of diabetes with major focus on management of diabetes. Diet, exercise, drugs, communication and nutrition education/awareness as major components of dietary management will be highlighted.

WHAT IS DIABETES MELLITUS?

Diabetes Mellitus (DM) is a condition, when the blood glucose or so called "blood sugar" is too high. Diabetes is a disease that affects body's ability to produce or respond to insulin. What is insulin? Insulin, you may recall is a hormone that is released in response to food we eat. In a normal healthy person the pancreas release insulin to help the body store and use the sugar from the food they eat. Foods, particularly carbohydrate-rich foods in our diet namely, rice, wheat, potatoes etc. are digested and broken down into a sugar called glucose. Glucose is vital for our health because it is an important source of energy for our body. Insulin helps to utilize this glucose for the production of energy by the body for our daily activities. Insulin also stimulates the cells to take up glucose, thus prevents a rise in blood glucose and maintains its level within certain normal limits.

Now what happens when a person is suffering from diabetes? In diabetic individuals, the pancreas (the organ that produces insulin) cannot produce enough insulin or whatever is produced is not efficiently used by the body and sugar builds up in the blood (hyperglycemia). This condition when insulin is not efficiently used by the body is called *insulin resistance*.



Diabetes mellitus is a metabolic syndrome characterized by hyperglycemia with disturbance of carbohydrate metabolism resulting from defect in insulin secretion, insulin action or both.

In Diabetes, there is excessive glucose in blood and urine due to inadequate production of insulin or insulin resistance. Generally, in normal persons, without diabetes fasting glucose levels are maintained at less than 110mg/dl. After a meal (post prandial), the plasma glucose level increases but insulin stimulates the cells to take up glucose and thus the plasma glucose levels return to basal level within 2 hours. The criterion for the diagnosis of diabetes is given in Table 6.1. You would notice that fasting plasma glucose (FPG) more than or equal to 126mg/dl and plasma glucose level 2 hour post meal (or post 75g glucose) more than or equal to 200mg/dl is diagnosed as diabetes

Table 6.1: Criterion for the diagnosis of diabetes

Plasma Glucose Level (mg/dl)		
	Fasting	**Post parandial (PP) 2-hr post meal**
Normal	<110	<140
Diabetes	>126	≥200

Source: ICMR Guidelines for Management of Type 2 Diabetes, 2005

Generally, glucose is excreted in urine when blood glucose levels are high, beyond 180mg/dl. This condition is described as renal *glycosuria*. It may be noted that diabetics lose varying

amount of glucose in urine depending on severity of diseases and dietary intake of carbohydrates in their diet.

Another concept, important to diabetes status, which needs special mention here, is *Glycosylated Haemoglobin* (HBA1c). When the concentration of glucose in blood rises, more of it gets attached to haemoglobin (which is a pigment present in red blood cells that carries oxygen to the cells of the body) forming *glycosylated haemoglobin* (HBA1c). In a normal individual without diabetes, the HBA1c concentration varies from 5-6%, while in diabetics, it increases to over 6% of the total haemoglobin depending on the blood glucose level. So what is the significance of HBA1c? HBA1c shows the general trend of glucose levels in the blood during the previous 2-3 months. HBA1c helps determine how well a person's diabetes is being controlled over time.

TYPES OF DIABETES

There are two main types of diabetes:

- Type 1 diabetes and
- Type 2 diabetes

Type 1 Diabetes Mellitus

Type 1 diabetes results from the pancreas's failure to produce insulin. This form was previously referred to as 'insulin-dependent diabetes mellitus' (IDDM) or 'juvenile diabetes', Type 1 diabetes may affect people at any age, but usually develops in children and adolescents, hence was referred to as juvenile diabetes earlier. Type 1 diabetes is an autoimmune disease. Autoimmune refers to the fact that the body's immune system (which normally helps in fighting infections) attacks and destroys the insulin producing cells of the pancreas. As a result there is little or no production of insulin and hence, such individuals require daily dose of insulin injections to control the level of glucose in the blood. When insulin is not provided it can lead to life threatening consequences.

Type 2 Diabetes Mellitus

Type 2 diabetes is the common form of diabetes, with 90-95% of people with diabetes having this condition. Type 2 diabetes begins with *insulin resistance*. This means no matter how

much or how little insulin is made, the body cannot use it as well as it should and sugar builds up in the blood. As the disease progresses eventually no insulin is produced. This form was previously referred to as 'non-insulin dependent diabetes' or 'adult onset diabetes', because it was diagnosed mainly in adults, who did not require insulin to manage their condition. It is associated with excessive body weight and/or fat (obesity) or sedentary lifestyle. Type 2 diabetes can occur at any age. Type 2 diabetes can be managed through exercise and diet but overtime people with this type of diabetes may require oral anti-diabetic drugs or/and insulin depending on the condition.

Besides the two types of diabetes highlighted above, you may come across cases where diabetes developed during pregnancy. This is referred to as *gestational diabetes*.

Gestational Diabetes

When a pregnant woman develops diabetes, it is known as gestational diabetes. Gestational diabetes usually disappears after pregnancy but is associated with complications to both mother and baby. The offspring's are prone to develop childhood obesity and type 2 diabetes later in life as an adult. Women with a history of gestational diabetes may also go on to develop type 2 diabetes immediately after delivery or few years after delivery.

Considering the different types of diabetes it is important that we look at the risk factors associated with diabetes. The next section focuses on the risk factors.

RISK FACTORS OF DIABETES

The causes of diabetes are multi-factorial and depending on the type of diabetes the risk factors contributing to the onset of the disease may vary. Actual cause is not clear, but factors that have been shown to increase the risk of diabetes are highlighted in Figure 6.1.

Figure 6.1: Risk factors of diabetes

In case of type 1 diabetes, it is an auto-immune disease. What is known is that the immune system (which fights infections, harmful bacteria, viruses in our body) attacks and destroys the insulin producing cells in the pancreas. For example viral infections such as measles, mumps can trigger abnormal auto immune response that destroy the insulin producing cells in the pancreas. Thus little or no insulin is produced. Instead of being transported to the cells, sugar then builds up in the blood. Genetic and environmental factors play an important role in the onset of this condition.

Type 2 diabetes, which you have learnt is the most common form of diabetes, is caused by many factors but the two important risk factors include *lifestyle factors* and *genes*. Among lifestyle factors, lack of physical activity, overweight, obesity increase the risk of developing diabetes in the later stage of a person's life. You would notice that about 90% of type 2 diabetic individuals are overweight or obese. Central obesity (accumulation of fat around the abdomen indicated by higher waist circumference) is known to increase insulin resistance. How does obesity increase the risk of diabetes? Well obesity reduces the sensitivity of tissues to insulin action in the utilization of glucose. Next, unhealthy eating habits and practices (such as eating too much of fat, simple sugars, and refined foods and not consuming enough fibre in the diet) have been shown to influence the development of diabetes. Further, type 2 diabetes seems to run in families, indicating genetic predisposition or hereditary as risk factor. Among other factors, ageing i.e. increased age enhances the risk of type 2 diabetes. Stress which is so common in modern life is now increasingly being recognized as a risk factor for disease onset and progression.

Having gone through the risk factors, you may have realized that many of these factors can be controlled by the choices we make. For instance physically inactivity, obesity, unhealthy diets, stress can be controlled and are therefore called modifiable risk factors. Others such as hereditary, age, history of gestational diabetes we cannot change or modify, hence are fixed. Remember the risk for diabetes increases if an individual is:

- Overweight and obese, particularly central obesity i.e. accumulation of fat around the abdomen indicated by higher waist circumference,
- On an unhealthy diet, consuming too much fat, simple sugars, refined foods and low intake of dietary fibre (inadequate fruit and vegetable consumption),
- Age 40 or older. Risk increases as you grow old

- Has a parent or sibling with diabetes
- Physically inactive i.e. living a sedentary life,
- Has high blood pressure, high cholesterol or high triglyceride
- Have had gestational diabetes

So more the risk factors you have the greater the chances of developing diabetes and other health issues.

What are the clinical symptoms and consequences, complications associated with diabetes? Next we shall focus on the common problems, complications and symptoms linked with diabetes.

CLINICAL SYMPTOMS AND COMPLICATIONS OF DIABETES

How can you tell if a person has diabetes? Well, the symptoms of diabetes are very typical, but sometimes they are so mild that we don't notice them. But in case of Type 1 diabetes, the symptoms usually happen quickly and are much more severe as compared to type 2 diabetes. However, you would notice that both types of diabetes have some warning symptoms which include:

- Frequent and increased/excessive urinary output (Polyuria)
- Feeling of thirst (Polydipsea) and dry mouth
- Hunger, increased appetite (Polyphagia) even though the individual is eating
- Extreme fatigue, lack of energy, easy tiredness and irritability
- Unexplained Weight loss
- Blurry vision
- Frequent infections such as skin, vaginal infections
- Cuts, bruises, sores which are slow to heal, and
- Tingling sensation, pain or numbness in the hands and feet

The symptoms may seem mild, but it is important to note that diabetes can increase the risk of many serious health problems, if not controlled. Diabetes can cause a host of complications - acute as well as long term - affecting nearly every organ in our body including heart, blood vessels, eyes, kidneys, gastrointestinal tract, gums, teeth etc. But the good news is that controlling diabetes can help avoid these complications or prevent them from becoming worse.

The acute complications of diabetes include:

Diabetic ketoacidosis: Ketoacidosis is a serious complication of diabetes that occurs when the body produces high levels of blood acids called *ketones*. How are ketones formed? When there is not enough insulin, the body cannot utilize carbohydrates to provide energy. So to meet the energy needs, the body begins to break down fat as a fuel. This results in increased formation of ketones. When the ketones produced are more than what the body can handle, they accumulate in the blood resulting in ketoacidosis. Note, ketoacidosis can be fatal and the patient may go into coma. This condition usually results from irregular or inadequate management of diabetes, particularly during stress and acute infections.

Among *long-term complications*, heart diseases and blood vessel diseases are common problem. Due to injury to large blood vessels, diabetics have increased predisposition to atherosclerosis (hardening of blood vessels due to deposition of fatty substances). Diabetics may have high levels of blood lipids, such as cholesterol and triglycerides, which make them susceptible to heart diseases and stroke. Diabetes can also lead to eye problems such as glaucoma, which may cause blindness if not treated. So the bottom line for diabetics is to get tight control of the blood glucose levels and thus prevent the complications from getting worse.

Besides the acute and the long-term complications highlighted above, one short-term complications of diabetes which requires mention here is hypoglycemia.

What is hypoglycemia?

Unlike increased glucose levels in the blood, the rapid and severe lowering of blood glucose below certain critical normal limit (below 40 - 50 mg/dl) in the body is known as *hypoglycemia*. The person with hypoglycemia experiences weakness, sweating, restlessness, palpitation and giddiness. What may be the cause of hypoglycemia? It is possible for the blood glucose levels to drop when there is inadequate amount of carbohydrates in the diet, particularly under conditions when an individual is on insulin or taking insulin on an empty stomach or while fasting. Hypoglycemia can also occur following a strenuous exercise.

Cases of hypoglycemia can be treated by immediately providing orange juice or glucose, sugar or sweet, which can rapidly raise the blood glucose level. It is always advisable for a diabetic to carry any one of these substances as a protective measure.

Remember maintenance of blood glucose within normal limits helps to prevent and limit progression of diabetic complications. A patient who maintains the blood glucose levels within the normal range suffer from much less short and long term complications as

compared to those who frequently experience fluctuations (some time high, some time low) in the blood glucose levels.

Management of diabetes requires individualized care and treatment. Cooperation of the patient, therefore, is very important in the management of diabetes. Next section focuses on management of diabetes.

MANAGEMENT OF DIABETES

It is important to understand that diabetes cannot be completely cured or treated, but it can be managed carefully in order to prevent/delay the development of complications. Management of diabetes is quite individualized and focuses not only on the diabetic state but also on the overall health and well-being of the diabetic patient. There are four main aspects in the management of diabetes. These include:

- Dietary Management
- Lifestyle Management - Exercise
- Adherence to Drugs/Medication, Insulin schedule, and
- Education, communication and awareness

Our main focus here in this unit will be on dietary management. But it is important to highlight here that regular exercise should be an integral part of the daily routine of the diabetic. Physical activity guideline for Asians population is highlighted later in this Unit. Do read it carefully. Further, adherence to medication and diabetes diet education are equally important factors in the management of diabetes.

We begin our study of dietary management of diabetes by first looking at the main objectives in the management of diabetes.

Dietary Management of Diabetes

Diet plays a crucial role in the management of diabetes. The main objectives of dietary management of diabetes are to:

- attain and maintain ideal/desirable body weight
- achieve and maintain normal blood glucose levels and reduce the sugar in the urine
- provide adequate nutrition to maintain optimal nutritional status
- treat the symptoms, and

- prevent/avoid the acute complications
- achieve optimum blood lipid levels

Qualitative and quantitative changes in the nutrient intake, dietary habits and food choices may be required based on age, gender, weight, physical activity and insulin/drug dosage of the patient. A diabetic diet is quite individualized and usually an adaptation of normal diet. Many people might feel that their diet may need to be changed completely or it may deviate from the normal diet. It may not be the case. Little changes in the kind and type of foods we include in the diet will go a long way in managing the disease condition. Let us learn about these changes and diet therapy during diabetes.

In general, the nutritional needs of a diabetic are not much different than the needs of a non-diabetic individual. For instance, in case of a normal healthy individual, the normal diet should provide 60-65% calories from carbohydrates, 20-25% calories from fats and rest (15-20%) from proteins. A diabetic diet too can follow this distribution, but is governed by the present body weight of the patient and the need to maintain the desirable or ideal body weight. The nutrient needs and dietary modifications for diabetes are highlighted in Table 6.1. Before you review these considerations, it is important for you to understand that carbohydrates and dietary fibre play a major role in the control of blood glucose. Glycemic index is a guide used to classify carbohydrate containing foods according to their potential to raise the blood sugar level. It is therefore useful in planning diets for diabetics. Read the concept of glycemic index presented in the next section first. This will help you conceptualize the nutrient needs and considerations presented in Table 6.1.

Table 6.1: Dietary considerations and nutritional needs for diabetics

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) ***For adults*** To maintain body weight at 10% lower than the ideal/desirable body weight.	Based on body weight and physical activity level the calorie requirement include: *For **Overweight/Obese individual*** - *Sedentary activity*: 20 Kcal/kg body wt/day. - *Moderate activity*: 25 Kcal/kg ideal body wt/day *For **Ideal weight individual*** - *Sedentary activity*: 30 Kcal/kg ideal body wt/day. - *Moderate activity*: 35 Kcal/kg ideal body wt/day *For **Underweight individual*** - *Sedentary activity*: 40 Kcal/kg body wt/day. - *Moderate activity*: 45 Kcal/kg/body wt/day	*Distribution of dietary calories*: - Carbohydrate: 55-60% of total calories - Fat: 20-25% of total calories - Proteins : 10-15% of total calories
For children suffering from Type 1 diabetes Dietary allowances as recommended for their age group. (Refer to RDA (ICMR 2010)	Energy needs of children are generally higher to meet their growth and development needs. *For child 10-12 years, energy need:* - Boys: 2190 Kcal/day, and - Girls: 2010 Kcal/day	
Proteins (g) 15-20% of total calories to be derived from proteins.	Include Adequate protein in the diet:: - An intake of 1g protein per kg body weight for adults - Intake of 1-1.5g protein/kg body weight for insulin dependent diabetic children. - Proteins are essential for growth, development and tissue repair	Emphasis should be laid on the inclusion of protein from plant sources (as they are low in fat but high in dietary fiber hence raise blood glucose to lower extent). Protein-rich food sources include: • Pulses, legumes, beans, peas, lentils and nuts. • Lean meats and fish. • Low fat milk and milk products. - Provide fish more frequently (at least 100-200g/week) in preference to meat and poultry. -Limit the consumption of eggs (3eggs/week). However egg white may be provided in good

		amounts.
Carbohydrate 55 - 60% of total calories to be provided by carbohydrates.	1.*Alter the type of carbohydrate* in the diet. (*Low Glycemic index* (GI) foods to be included). *2. Distribute Carbohydrate in the diet in 4-5 equal parts* -One-third (33%) of the carbohydrate served during lunch -One-third during dinner -Remaining one-third: 20% served during breakfast, 7% during mid-morning snack and 7% during evening tea or at bed time.	- Complex carbohydrates from vegetables, fruits, whole grain cereals, whole pulses, legumes may be preferred as they have low GI. -Foods such as potatoes, breads, noodles, pasta and those made from refined carbohydrates (maida-based products which have a high GI) need to be restricted. - Sugar, honey, jaggery, jam contain refined/simple carbohydrates which are directly absorbed and cause rapid rise in blood glucose not recommended. -Sugars present in fruits and milk raise blood glucose at a slightly slower rate therefore can be taken in the right quantity only.
Fats and Oils **20-25**% of total calories to be derived from fats	- Fats from vegetable sources are better than those from animal sources	-- Combination of vegetable oils should be preferred such as : • Groundnut or Sesame or cotton seed or Rice bran oil or safflower oil along with Mustard oil or Canola or Soyabean oil - Limit the use of butter, ghee. - Hydrogenated vegetable oil (vanaspati) should be avoided. - Foods rich in saturated fats such as red meat, organ meats (liver, kidney, brain), whole milk and its products provide high amount of invisible fat should be restricted. - Fat in processed, ready-to-eat foods, bakery foods is known as hidden fats. Minimize the consumption of these foods.
Vitamins and Minerals (Meet the daily dietary recommended intake)	Diabetics may require higher amounts of vitamins and minerals in the form of supplements Consumption of plant based foods (fruits and vegetables) are healthy for diabetics as they help : - maintain adequate	Emphasis should be laid on: - Wholesome vegetables such as: • Non-starch vegetables (radish, cucumber, bottle gourd, beans etc.) • Green leafy vegetables (such as spinach, amaranth) used in

	micronutrient (vitamins, minerals and antioxidants) level - reduce the risk of hypertension, heart disease, cancer etc., - Lower blood sugar and cholesterol levels by providing fibre, and - improve satiety.	soups, curries, dals, chutneys - Whole fruits recommended in moderation (1-2 serving) such as: • Apple, pear, guava, berries, pomegranate (low GI fruits) wherever possible with their edible peels. - Avoid serving fruit juices as they may also contain added sugar which is not good for diabetics. - Fruits with high amount of sugar and with high glycemic index like banana, mangoes, dates, grapes, oranges, custard apple, pineapple, chikoo (sapota) should be taken with precaution. - Roots and tubers like potato, yam, sweet potato, beetroot, tapioca and colocasia are not recommended as they are rich sources of energy and also have high glycemic index. - Common salt up to 6g/day is permitted. Restrict pickles, papad, chutni, sauces and processed fruits and vegetables.
Dietary Fibre (25g fibre per 1000 calories per day)	Dietary fibre: - help in proper bowel function and relieve constipation -providing satiety (fullness) thus reducing hunger and preventing overeating -reduce blood glucose and serum cholesterol levels, and - have low caloric value	Fibre present in vegetables and fruits, legumes and fenugreek seeds is soluble in nature and is relatively more effective in controlling blood glucose. Fibre rich foods include: - Whole grain cereals (ragi, jowhar, barley, oats) and their products like oatmeal, whole wheat bread, - Whole pulses, soyabean - Green leafy vegetables and raw vegetables, fruits with hard skin in the form of salads - Fenugreek seed

Glycemic Index

Glycemic index (GI) describes the rise of blood glucose occurring after a meal. In a given meal there can be different foods. It is, therefore, important to know about the extent of rise in blood glucose with a given quantity of a particular food.

Different carbohydrates raise blood glucose to variable extent. GI, therefore, gives a ranking of how quickly each carbohydrate-base food or drink makes the blood glucose rise after consuming them, in comparison to the response to an equivalent amount of glucose. A rating of each food between *Zero to 100* is provided. Glucose raises the blood sugar levels very quickly and has a GI of 100. In comparison multi-grain *Roti* has low GI of 27 and is beneficial for diabetics. GI, therefore, is a useful guide in planning diets for diabetics. Generally, there is no standard way to categories food based on GI, but for convenience three categories of food based on their GI value can be considered: the high-GI index foods (value >70), intermediate-GI foods (>55 to <70) and low-GI foods (<55). For your reference glycemic index of some common foods used in Indian diets are presented in Table 6.2.

Table 6.2: Glycemic index of some common foods

Item	Glycemic Index	Item	Glycemic Index
Cereal and Millet Products		**Fruits**	
White wheat bread	75 ± 2	Apple (raw)	36 ± 2
Whole wheat bread	74 ± 2	Orange	43 ± 3
Wheat roti	62 ± 3	Banana	51 ± 3
Chappathi	52 ± 4	Pineapple	59 ± 8
White boiled rice	73 ± 4	Mango (raw)	51 ± 5
Brown boiled rice	68 ± 4	Watermelon (raw)	76 ± 4
Barley	28 ± 2	Potato (boiled)	79 ± 4
Instant oat porridge	79 ± 3	French fries (potato)	63 ± 5
Rice porridge/congee	78 ± 9	Carrots Iboiled)	39 ± 4
Millet porridge	67 ± 5	**Dairy Produtcs**	
Sweat corn	52 ± 5	Milk (full fat)	39 ± 3
Cornflakes	81 ± 6	Milk (skim)	37 ± 4
		Ice cream	51 ± 3
Miscellaneous		**Pulses**	
Chocolate	40 ± 3	Chick pease	28 ± 9
Popcorn	65 ± 5	Soya Beans	16 ± 1
Soft drinks/soda	59 ± 3	Lentils	32 ± 5
Honey	61 ± 3		
Glucose	103 ± 3		

Geared with the knowledge regarding GI and basic dietary considerations highlighted in Table 6.1, surely you must have realized that diabetes and blood glucose levels can be kept under normal limits through proper dietary management. Some important counseling tips, and list of foods that can be used liberally or used in moderate amounts or to be avoided completely are highlighted in Table 6.3. You may consult the list while planning the diet. For your reference a sample low calorie diet in also presented in Box 1 later in this Unit.

Table 6.3: Foods that can be used liberally, moderately and best avoided in the diet of diabetic individuals

Foods that can be used liberally	Foods to be used in moderate amounts	Foods to be avoided
1. Green leafy vegetables like spinach, drumstick, fenugreek, mustard, amaranth, cabbage etc. 2. Vegetables like cauliflower, brinjal, lady finger Bhendi), bottle gourd (ghia), Bitter gourd (karela) etc., 3. High-fibre foods (raw fruits with hard skin or seeds, green leafy vegetables, other vegetables etc.) 4. Condiments and Spices (fenugreek seeds, pepper dry, cumin, cloves cinnamon, tumeric, poppy seeds etc.)	1. Whole grain cereals, millets and their products e.g. whole wheat flour, whole wheat bread, oats, bajra, jowar roti etc. 2. Whole pulses, lentils with husk, chick peas, pigean pea, beans, peas etc. 3. Raw fruits with hard skin or seeds such as apple, pear, guava, apricots, berries, pomegranate, etc. 4. Fruits like banana, mangoes, dates, grapes, custard apple, chikoo (sapota), oranges *should be taken with caution*. 5. Nuts and Oilseeds 6. Milk and dairy products (low fat). 7. Meat and meat products, preferably fish, chicken, egg white. 8. Artificial sweeteners.	1.Refined cereals and their products (e.g. maida, sugi, white bread, white rice, pasta etc.) 2. Plain gelatin based desserts, sugars, sweets, honey, candy, jam and jellies. 3. Sweet concentrated foods using excessive whole milk and dairy fat including halwas, ladoos etc. 4. Cakes and pasteries. 5. Sweetened juices and soft drinks 6. Processed foods with high fructose corn syrup. 6. Red meat and organ meat (liver, brain etc.) 7. Roots and tubers like potato, yam, sweet potato, beetrool, tapioca, colocasia (arbi) not recommended 8. Fried fatty foods such as samosas, pakoras, puri, paratha cooked in vanaspati.

In addition to the list provided in Table 6.3, some do's and don'ts and basic tips are presented in Table 6.4. Make a note of these.

Table 6.4: Do's and Don'ts

Do's	Don'ts
1. istribute the intake of carbohydrates in accordance with daily needs into 4-5 equal parts (meals) 2. Whole cereals, millets and pulses contain complex carbohydrates; dietary fibre should be preferred to refined carbohydrate-rich foods such as refined flour, sugar, honey etc. 3. Green leafy vegetables can be given raw or used in soups, curries, dals and chutneys. 4. Ghee, butter, coconut oil (solid at room temperature) contain saturated fat should be taken in small quantities only 5. Vegetable oils, such as sunflower oil, groundnut oil, rice bran oil, soyabean oil are recommended for optimal health 6. Fibre present in vegetables, fenugreek seeds is soluble in nature and is effective in controlling blood glucose levels. Diabetics should consume such foods liberally. 7. Wholesome fruits and low fat milk in moderate amounts may be consumed by diabetics. 8. Take vegetables as desired 9. Individuals who develop hypoglycemia should immediately be given sugar or glucose and consult a doctor. 10. Diabetics should do regular exercise (refer to next section for recommendations). 11. Diabetics are advised to use artificial sweeteners (such as sucralose, saccharine and aspartame) in place of sugar. 12. Drugs, medication, insulin should be taken as per the advice of the physician.	1. Avoid refined cereal, flour preparations. 2. Avoid sweets 3. Fruit juices may contain high amount of added sugars which are not good for diabetics hence avoided. 4. Avoid eating large meals at one time. 5. Avoid excessive use of fat in cooking 6. Vanaspati contains saturated fat which increase the risk of heart disease hence should be avoided or restricted. 7. Avoid fasting or skipping meals as it may lead to hypoglycemia. 8. Alcohol consumption is best avoided as it provides empty calories (does not contain protein or other nutrients). Extra calories from alcohol may make a diabetic overweight/obese

Physical Activity Guidelines for Indian Population

The health benefits of physical activity are well established. Lifestyle intervention studies have shown that Type 2 diabetes and coronary heart disease (CHD) can be prevented with appropriate physical activity and diet. What is appropriate physical activity for the Indian population? The guidelines for adults and children are highlighted herewith:

1. A total of 60 min of physical activity is recommended every day for healthy Asian Indians in view of the high predisposition to develop T2DM and CHD. This should include at least 30 min of moderate-intensity aerobic activity (e.g., brisk walking, jogging, hiking, gardening, bicycling etc.), 15 min of work-related activity (e.g., carrying heavy loads, climbing stairs etc.), and 15 min of muscle-strengthening exercises (such as playing on playground equipment, climbing trees, playing tug-of-war, lifting weights etc.).

2. For children, moderate-intensity physical activity for 60 min daily should be in the form of sport and physical activity.

Educate the diabetic patients to follow an appropriate physical activity schedule.

Diabetes Education: Cornerstone of Diabetes Management

Unlike other disease conditions (such as high blood pressure or high cholesterol levels) where medication alone can often time successfully treat it; here there are lots of other components to diabetes. Diabetics require day-to-day knowledge of nutrition, exercise, medication, glucose monitoring, psychosocial adjustment etc. Diabetes education therefore becomes important. Diabetes education means empowering people with diabetes with knowledge and provide tools crucial for making them active partners in the diabetes management team. People with diabetes need to be educated regarding:

- The nature of disease, the possibility of development of short term and long term complications, if the condition is not managed appropriately.
- Self monitoring skills - Importance of monitoring urine and blood glucose levels, blood pressure and serum lipids at regular intervals,

- Appropriate self-care skills - understanding the symptoms of hypoglycemia and the immediate need for taking sugar in such conditions; importance of regular check-up of their feet, eyes and kidneys,
- Appropriate resources - Taking medication regularly as advised by the doctor. Patients taking insulin injections should know how to measure the insulin dose and take injection by themselves; regular exercise and how it should form an integral part of daily routine,
- Positive attitude - holistic approach that includes behavioral modification to develop positive attitude and healthy life style.

Remember, the compliance of people with diabetes is essential for effective management. Appropriate support and counseling is an essential component of the management of diabetes. Diabetes education is an ongoing process which needs to be repeated involving nutritionist and/or diabetic educator, physicians.

Unit - 3

EATING DISORDERS (DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the term eating disorder,
2. define and differentiate between different types of eating disorders,
3. explain the causes, clinical symptoms, metabolic changes and consequences of eating disorders, and
4. discuss the management of eating disorders with special reference to nutritional management.

In Unit 5 we discussed about Obesity a term used to describe high body weight. You would notice that one in five people described as obese have disordered eating behavior. Disordered eating behavior includes a wide range of eating related problems such as inadequate eating pattern, including binge eating, purging and restrictive diet to lose or control weight, unhealthy dieting practices, maladaptive behavior related to dissatisfaction with body shape or size. Adolescents, young adulthood is a period of increased awareness of one's body appearance and having a distorted body image or negative perception about one's body weight and shape during this phase of life can be a potent cause of several unhealthy body-related behaviors and disordered eating patterns. In this unit we will focus on these issues. We will learn about eating disorders - the types, causes, consequences and what dietary measures to adopt to manage the disordered eating condition.

WHAT ARE EATING DISORDERS?

Eating disorders are illnesses in which the people experience severe disturbances in their eating pattern/behaviors and related thoughts and emotions. People with eating disorders typically become pre-occupied with food and their body weight. These disorders can affect a person's physical and mental health. Eating disorders are serious and sometimes fatal and life-threatening.

In literature you may come across many types of eating disorders such as anorexia, anorexia nervosa, bulimia nervosa, binge eating disorder, purging, eating disorder not otherwise specified etc. Common eating disorders include binge eating disorder, bulimia nervosa, and, less common but very serious, anorexia nervosa. These conditions are defined herewith.

Binge Eating Disorder

Binge eating disorder is characterized by recurrent binge (excessive indulgence in eating) episode during which a person feels a loss of control and marked distress over his or her eating. Three particular features are characteristic of binge eating. These include: i) the amount of food eaten is larger than most persons would eat under similar circumstances, ii) the excessive eating occurs in a discreet period, usually less than 2 hours, and 3) the eating is accompanied by a subjective sense of loss of control.

You would notice that people with binge eating disorder often are overweight and obese.

Bulimia Nervosa

Bulimia nervosa is an disorder characterized by binge eating (eating large amount of food in a short time, along with the sense of loss of control) followed by a type of behavior that compensates for the binge, such as purging (including self-induced vomiting), excessive use of laxatives or diuretics, fasting and/or engaging in excessive exercise.

You would notice that people with bulimia can fall within normal range for their weight. But, they often fear gaining weight, want desperately to lose weight, and are intensely unhappy with their body size and shape.

Anorexia Nervosa

Anorexia refers to loss of appetite. Anorexia nervosa, therefore, is a disease characterized by a significant and persistent reduction in food intake leading to extremely low body weight in the context of age, sex, and physical health. Features characteristic of anorexia nervosa include: i) a relentless pursuit of thinness, ii) a distortion of body image and intense fear of gaining weight, and iii) extremely disturbed eating behavior.

You would notice people with anorexia see themselves as overweight, even when they are starved or severely malnourished.

Binge eating disorder is the most common eating disorder. Eating disorders occurs most commonly in adolescent girls and young women, but adolescent boys and young men may be affected more rarely, as may children approaching puberty and older women up to the menopause. In India, information regarding these disorders is limited.

CLINICAL CHARACTERISTICS, SIGN, SYMPTOMS OF EATING DISORDERS

Having looked at the different types of eating disorders surely you may be able to distinguish between these specific conditions. To help you recall, you studied that:

- Unlike bulimia nervosa, in binge eating disorder, binge eating episodes are not followed by purging, fasting or excessive exercise. People with binge eating disorder are often overweight or obese,
- Unlike anorexia nervosa, people with bulimia can fall within the normal range for their weight.
- People with anorexia see themselves as overweight, even when they are starved or severely malnourished.

Some common clinical characteristics and sign, symptoms associated with these disorders are highlighted in Table 7.1. Surely they will help you in diagnosis or further identification of an eating disorder.

Table 7.1: Clinical features, signs and symptoms of eating disorders

Anorexia Nervosa	Bulimia Nervosa	Binge Eating Disorder
- Profound Weight loss leading to maintenance of body weight 15 percent below normal, - Dieting, deny hunger, even when one is thin or emaciated, - An intense fear of weight gain or becoming fat despite the individual's underweight status; - Excessive or compulsive exercising, - Delayed puberty (if early onset) and in females, amenorrhoea i.e. absence of atleast three consecutive menstrual cycles, - Strange eating habits such as avoiding meals, eating in secret, monitoring every bite of food, - Sensitivity to cold	- Frequent fluctuations in weight. Individual is usually normal weight to overweight - Eating large amount of food in a short time, along with the sense of loss of control, - Purging (self-induces vomiting) after meals - Inability to voluntarily stop eating/feeling guilty or ashamed about eating, - Overeating in reaction to emotional stress. - Irregular periods in women - Swollen glands , tooth decay - Depressive moods - Persistent over concern with body shape and weight -Exercising or dieting excessively -Using laxatives, diuretics or other pills after eating when	- Food seeking in the absence of hunger (such as after a full meal), - Excessive eating, amount of food eaten is large at one time, - A sense of lack of control over eating, - Absence of purging (self-induced vomiting), fasting or excessive exercise

- In severe cases, the bones protrude through the skin, as there is hardly any body fat. - The skin may be dry and scaly. - Body hair is increased (excessive growth of coarse hair in women),	they are not needed - Dehydration, Electrolyte imbalance which can lead to kidney and heart failure	

You would have realized that certain characteristics are specific to each one of these disorders, which can help us in diagnosing and differentiating these specific disease conditions. In binge eating disorder, excessive eating is characteristic. 1 in 5 patients who binge may consume as much as 5000Kcal in a typical episode. The food usually eaten during a binge episode consists of all forbidden foods: chocolate, chips, cookies, cake, ice cream, pizza; food that is easy to eat and do not require any preparation.

But in children and teenagers, eating disorders can overlap. For example, some individuals may alternate between periods of anorexia and bulimia. Also people with eating disorders may struggle with one or more of the following psychological problems: distress, anxiety, feeling of helplessness, low self esteem, inability to concentrate, unable to engage in conversation and withdrawn. The reality behind these conditions is that the brain is literally unable to function properly due to the lack of nutrition available to the body. Thus knowledge of these signs/symptoms is critical. Understanding the signs, symptoms will help in identifying target symptoms and behaviors that will be addressed in the treatment plan. We will learn about the management of eating disorders later in this unit. Next let us look at the causative factors.

WHAT CAUSES EATING DISORDERS?

The exact cause of eating disorders is not known. But, it is thought to be multi-factorial in origin. The multidimensional causative factors may include: vulnerable personality; psychological conflicts – individual and family relationship; socio-cultural environmental

factors - cult of thinness, hazardous dieting, social class and race and finally genetic and constitutional factors.

The best-known environmental contributor to the development of eating disorders is the socio-cultural idealization of thinness. Young children start to express concern about their own weight or shape or about becoming too fat. Beauty and appearance anxiety are critical global issues and media and advertizing are key factor driving this concern. Pictures, television, magazines influence children's/adolescents concept of the ideal body shape, influencing them to want to lose weight and promoting unrealistic standard of beauty. This concern endures through life.

Teenage girls and boys use unhealthy weight control behavior such as skipping meals, crash dieting, fasting; smoking, excessive exercising. self-induced vomiting and taking laxatives. Dieting is important predictor of developing eating orders. It is important to note that those who diet moderately are 5 times more likely to develop an eating disorder and those who practice extreme restrictions. They are 18 times more likely to develop an eating disorder than those who do not diet. Multiple studies have found that dieting is associated with greater weight gain and increased rates of binge eating in both boys and girls.

Bullying, weight stigma has been identified as yet another factor. Overweight girls and boys are teased about their weight by peers or family members. Individuals report coping with weight stigma by eating more food. Weight teasing or weight-based victimization among youth thus predicts weight gain, frequent binge eating, are at increased risk for eating disorder symptoms, and are more likely to have a diagnosis of binge eating disorder. Weight stigma is also a significant risk factor for depression, low self esteem and body dissatisfaction among individuals.

Occupation/profession may also play a role. Athletes are at-risk, especially those competing in sports that tend to emphasize diet, appearance, size and weight, such as weight-class sports (wrestling, rowing, horseracing etc.) and aesthetic sports (bodybuilding, gymnastics, swimming etc.). Thought most athletes with eating disorders are females, but male athletes also are at-risk. Similarly dancers have a prevalence of anorexia 10 times that of general population

Further, it is possible that the disorders begin when there are disturbed family relationships or dysfunctional families, e.g., when the parents are not getting along or pretend to be getting along well with each other but are actually highly dissatisfied with their marriage. Such a family may be overprotective, rigid and too goal oriented. Some may have unusual interest in weight, food or shape of the body. The eating disorder for the child in such a family serves as a focus in order to bring control into an otherwise chaotic life. It is not clear how these factors lead to intense fear of being fat that is central to both anorexia and other eating disorders like bulimia.

Some factors leading to binge eating are highlighted in Figure 7.1. The other binge triggers include being alone, having unstructured time after going home (from school or work), boredom.

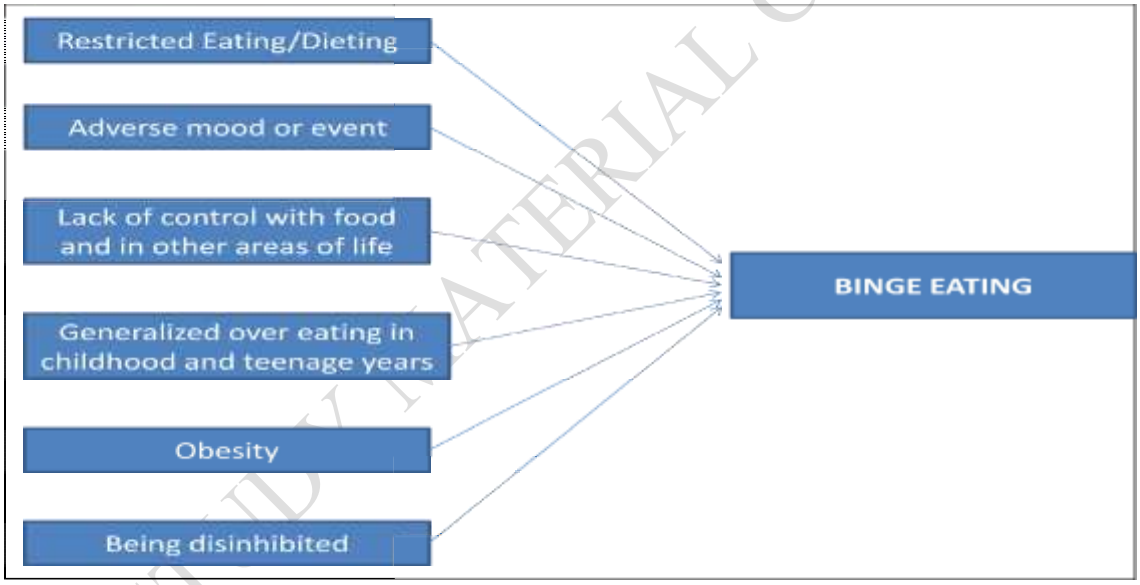


Figure 7.1: Risk factors to binge eating

Knowledge of these causative factors can play an important role in management of the disease condition. The next section deals with management of eating disorders.

MANAGEMENT OF EATING DISORDERS

The management of eating disorders should be a multidisciplinary approach. A multidisciplinary team comprising of a physician, nutritionist and psycho-therapists is usually involved in their management. The treatment of eating disorders can be said to have three components.

A) Medical and Biochemical Management

B) Nutritional Management, and

C) Psychological Management

Our focus in this unit will be only on nutritional management as psychological and medical management are not within our purview.

Nutritional Management of Eating Disorders

Here in this section we will consider the components of the management of anorexia nervosa and bulimia nervosa together, since the nutritional consequences and nutritional management for both these conditions are on similar lines. Malnutrition due to low or poor consumption of energy-giving macronutrients, such as carbohydrates, fats, proteins and/or micronutrients relative to individual needs is a concern with both anorexia nervosa and bulimia nervosa. In both the cases, consideration needs to be given to symptoms of the starvation syndrome. Starvation syndrome here refers to starvation caused either by food restriction/dieting as in anorexia nervosa or problems related to food absorption as in purging or excessive exercise may mean that insufficient energy is consumed for weight maintenance in bulimia nervosa.

The aims of nutritional management or dietetic treatment of eating disorder therefore should be to:

- establish a normal pattern of food intake,
- encourage a nutritional intake appropriate to the individual's needs, and
- maintain a body weight within a normal range

In severely malnourished/underweight patients the goals of nutritional therapy should be to restore weight, normalize eating patterns, achieve normal perception of hunger and satiety and correct the biological aspects of malnutrition. We need to understand that in the severely malnourished patients, two separate but linked processes occur. First, inadequate food

consumption leads to wasting (tissue loss) and functional changes in all tissues. Second, the general metabolic response to infection, trauma or other stress results in further specific nutrient losses and cellular damage. Now starting to eat again after a period of prolonged starvation can precipitate problems and complications. Therefore, the first step has to be to repair the body. Tissue repletion is a secondary consideration. The energy needs of a patient with an eating disorder, therefore, are challenging to predict. The guideline for nutrient/diet therapy and nutrient intake for eating disorder patients are highlighted in Table 7.2.

Table 7.2: Dietary considerations and nutritional needs for eating disorder patients

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) *For Anorexia Nervosa patients*	*For Initial Phase:* - start at 30-40 Kcal/kg/per day i.e. approximately 1000 - 1600 kcal/day *Weight gainphase* - Increase daily intake by400-500 calories/ day. Advance progressively to 70-100 kcal/kg per day i.e. to 3000-3500 Kcal by the end of the month. *Weight maintenance Phase* - Provide 200-400 calories more than the recommended energy intake (specific to sex-, age-, weight-, and height).	- Avoid rapid refeeding of an individual in a state of starvation. *Simple tips to increase caloric intake to achieve a steady weight gain* i.e. 0.5–1.0 kg/week. - Increase the frequency of eating (from three times to six times a day) - Calorie count to target: A good initial rule of thumb is three 500- to 800-calorie meals plus at least three 300-calorie snacks - Increase energy dense food (add fat while cooking such as oil, butter, ghee which can increase calories without increasing portion size). - Slowly increase portion size - Supplement with liquid nutrition (high calorie drinks/supplements)
For Bulimia Nervosa Binge Eating Disorder Patient	Aim is to stabilize weight: - start at 30-40 Kcal/kg/per day i.e. approximately 1000 - 1600 kcal/day - Subsequently increasing to an intake corresponding to the estimated average requirement for the individual as recovery proceeds.	

Proteins (g) (15-20% of total calories to be provided by proteins)	Adequate protein intake (1g/kg body weight) to: -ensures proper metabolism -prevents muscle loss, and -provides for tissue repletion	Protein sources of high biological value (lean meat, fish, chicken, eggs etc.) need to be included in the diet. Cereal-pulse combination meals to be provided
Carbohydrate (CHO) (50-55% of total calories to be provided by carbohydrates)	Carbohydrates: - helpful in bowel movement.	It is important to include sources of insoluble fibre for optimal health and for relief from constipation.
Fats and Oils **(**25- 30% of total calories to be provided by total fat)	Dietary fat induces over consumption and weight gain through its: -low satiety properties, and -high caloric density.	Patients may have an aversion to fat, which makes weight gain difficult. Fat may therefore be included in the diet in a disguised form. For example, giving whole milk instead of toned milk. Add fat while cooking food such as oil, ghee, butter, cream.
Vitamins and Minerals (Meet the daily dietary recommended intake)	*Anorexic individuals* may have: - high rate of micronutrient deficiencies (namely thiamine, folic acid, vitamin C, iron, Zinc, selenium deficiency) -are at risk of developing deficiency of fat-soluble vitamins (such as Vitamin A, Vitamin D deficiency), *Bulimia nervosa* patients suffer from electrolyte (sodium, potassium, chloride, bicarbonate) imbalance due to purging behavior	- include 100% RDA multivitamin tablet with minerals - provide prophylactic thiamin supplements in oral form for those undergoing rapid weight gain - Provide 5-6 servings of cooked vegetables/fruits daily - Cut down on raw fruits and vegetables which can contribute to early fullness - Use oils fortified with vitamin A/D). - Correct fluid and electrolyte imbalance as advised.
Fluids (Liberal intake)	Liberal fluids intake is desired to: -compensate for the fluid losses in the body through purging/vomiting -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance	Fluid intake can be accomplished through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water. -Avoid rapid re-feeding or fluid overload.

The dietary considerations and recommendations provided in Table 7.2 may be used as basic guidelines for meeting the nutritional needs of patient suffering from eating disorders. Note, people with eating disorders are given a carefully prescribed diet, starting with small meals and gradually increasing the caloric intake. Each individual patient is given a goal weight range. As she/he approaches the ideal weight, more independence in eating habits is allowed. If, however, they fall below the set range, greater supervision may be reinstated. Patients are encouraged to monitor their intake and adopt structured eating i.e. eat 5-6 times per day (including 3 main meals, 2-3 snacks no closer than 2 hours together, no longer than 4 hours apart). All meals should have all macronutrients: carbohydrates, protein and fat. An illustrative 3000Kcal diet plan/menu is presented in Table 7.3 for your reference.

Table 7.3: Menu for a 3000 kcal diet for an eating disorder (anorexic) patient

Early Morning	Breakfast	Mid-Morning (Snack)	Lunch	Mid Afternoon (Snack)	Evening Tea (Snack)	Dinner
Milk shake (1 glass) OR Milk with any supplement like Ensure Nuts (8-10 pieces)	Paushtik Methi roti (2) OR Veg. yogurt sandwich (2) + Milk (1 cup)	Veg. Soup with cream and croutons (1 bowl)	Chapati (2)+ Fried Rice (1 katori) + Soya chunks curry (1 katori) + Vegetable (1 katori) + Raita(1 Katori)	Veggie pasta or Vegetable Upma (1 bowl)	Fruity Muffin OR Cup Cake (1) Milk(1 Cup)	Chapati (4) Dal (1 katori) Aloo Gobhi Sabji (1 katori) Mint chutney Cuatard or Sewiya (1 bowl)

The menu involves 3 meals per day and some snacks as appropriate with foods incorporated from all food groups to promote optimal nutrition. Based on the likes, dislikes of the patient the meals may be altered provided they are balanced.

Remember, *nutrition counseling/education* is an important component in the care/treatment of eating disorders. Nutrition counseling can be used to accomplish a variety of goals, such as reducing behaviors related to the eating disorder, minimizing food restrictions, correcting nutritional deficiencies, increasing the variety of foods eaten and encouraging healthy and not excessive exercise pattern.

Along with nutritional management you have learnt that psychological management is very important in eating disorder treatment. *Psychological management* targets at cognitive and behavior interventions. Psychological cognitive intervention targets unhealthy attitudes such

as body dissatisfaction and body image distortion. Behavioral interventions focus on problematic behaviors such as fasting, vomiting/purging and overeating. These psychological interventions also focus on the promotion of self-esteem, the development of stress management skills and the encouragement of healthy weight-control behaviors. It also considers the change in children's perceptions about the thin ideal promoted by the media and on developing children's ability to realistically assess what constitutes a healthy body shape and size.

Some do's and don'ts related to management of eating disorders are highlighted herewith. Remember eating disorders are long term illnesses and people recover slowly. Be patient and encourage the patient not to give up.

Do's	Don'ts
- Educate yourself about the eating disorder. This will equip you to help those around you suffering from the problem - Family support is extremely important, especially in helping the recovering patient with everyday tasks. Educate the family, friends regarding the disorder and encourage them to attend family counseling sessions. - Encourage the patient to seek medical help. But, don't be too forceful. This will make them more anxious - Encourage the person not to blame herself/himself or feel guilty or dwell on causes - Encourage the patient to attend support groups and read current literature - Encourage the patient not to skip meals or talk about dieting	- People with eating disorder are extremely self-conscious about their eating habits. Do not nag them about eating or not eating. This will reinforce the behavior. - Do not blame or shame the person. - Do not hide food to keep the person from binge eating. This will create resentment - Do not force the person to eat. This will make them feel out of control or childish. This will reinforce the behavior - Don't comment positively or negatively on appearance, shape or weight.

Unit - 3

EATING DISORDERS (DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the term eating disorder,
2. define and differentiate between different types of eating disorders,
3. explain the causes, clinical symptoms, metabolic changes and consequences of eating disorders, and
4. discuss the management of eating disorders with special reference to nutritional management.

In Unit 5 we discussed about Obesity a term used to describe high body weight. You would notice that one in five people described as obese have disordered eating behavior. Disordered eating behavior includes a wide range of eating related problems such as inadequate eating pattern, including binge eating, purging and restrictive diet to lose or control weight, unhealthy dieting practices, maladaptive behavior related to dissatisfaction with body shape or size. Adolescents, young adulthood is a period of increased awareness of one's body appearance and having a distorted body image or negative perception about one's body weight and shape during this phase of life can be a potent cause of several unhealthy body-related behaviors and disordered eating patterns. In this unit we will focus on these issues. We will learn about eating disorders - the types, causes, consequences and what dietary measures to adopt to manage the disordered eating condition.

WHAT ARE EATING DISORDERS?

Eating disorders are illnesses in which the people experience severe disturbances in their eating pattern/behaviors and related thoughts and emotions. People with eating disorders typically become pre-occupied with food and their body weight. These disorders can affect a person's physical and mental health. Eating disorders are serious and sometimes fatal and life-threatening.

In literature you may come across many types of eating disorders such as anorexia, anorexia nervosa, bulimia nervosa, binge eating disorder, purging, eating disorder not otherwise specified etc. Common eating disorders include binge eating disorder, bulimia nervosa, and, less common but very serious, anorexia nervosa. These conditions are defined herewith.

Binge Eating Disorder

Binge eating disorder is characterized by recurrent binge (excessive indulgence in eating) episode during which a person feels a loss of control and marked distress over his or her eating. Three particular features are characteristic of binge eating. These include: i) the amount of food eaten is larger than most persons would eat under similar circumstances, ii) the excessive eating occurs in a discreet period, usually less than 2 hours, and 3) the eating is accompanied by a subjective sense of loss of control.

You would notice that people with binge eating disorder often are overweight and obese.

Bulimia Nervosa

Bulimia nervosa is an disorder characterized by binge eating (eating large amount of food in a short time, along with the sense of loss of control) followed by a type of behavior that compensates for the binge, such as purging (including self-induced vomiting), excessive use of laxatives or diuretics, fasting and/or engaging in excessive exercise.

You would notice that people with bulimia can fall within normal range for their weight. But, they often fear gaining weight, want desperately to lose weight, and are intensely unhappy with their body size and shape.

Anorexia Nervosa

Anorexia refers to loss of appetite. Anorexia nervosa, therefore, is a disease characterized by a significant and persistent reduction in food intake leading to extremely low body weight in the context of age, sex, and physical health. Features characteristic of anorexia nervosa include: i) a relentless pursuit of thinness, ii) a distortion of body image and intense fear of gaining weight, and iii) extremely disturbed eating behavior.

You would notice people with anorexia see themselves as overweight, even when they are starved or severely malnourished.

Binge eating disorder is the most common eating disorder. Eating disorders occurs most commonly in adolescent girls and young women, but adolescent boys and young men may be affected more rarely, as may children approaching puberty and older women up to the menopause. In India, information regarding these disorders is limited.

CLINICAL CHARACTERISTICS, SIGN, SYMPTOMS OF EATING DISORDERS

Having looked at the different types of eating disorders surely you may be able to distinguish between these specific conditions. To help you recall, you studied that:

- Unlike bulimia nervosa, in binge eating disorder, binge eating episodes are not followed by purging, fasting or excessive exercise. People with binge eating disorder are often overweight or obese,
- Unlike anorexia nervosa, people with bulimia can fall within the normal range for their weight.
- People with anorexia see themselves as overweight, even when they are starved or severely malnourished.

Some common clinical characteristics and sign, symptoms associated with these disorders are highlighted in Table 7.1. Surely they will help you in diagnosis or further identification of an eating disorder.

Table 7.1: Clinical features, signs and symptoms of eating disorders

Anorexia Nervosa	Bulimia Nervosa	Binge Eating Disorder
- Profound Weight loss leading to maintenance of body weight 15 percent below normal, - Dieting, deny hunger, even when one is thin or emaciated, - An intense fear of weight gain or becoming fat despite the individual's underweight status; - Excessive or compulsive exercising, - Delayed puberty (if early onset) and in females, amenorrhoea i.e. absence of atleast three consecutive menstrual cycles, - Strange eating habits such as avoiding meals, eating in secret, monitoring every bite of food, - Sensitivity to cold	- Frequent fluctuations in weight. Individual is usually normal weight to overweight - Eating large amount of food in a short time, along with the sense of loss of control, - Purging (self-induces vomiting) after meals - Inability to voluntarily stop eating/feeling guilty or ashamed about eating, - Overeating in reaction to emotional stress. - Irregular periods in women - Swollen glands , tooth decay - Depressive moods - Persistent over concern with body shape and weight -Exercising or dieting excessively -Using laxatives, diuretics or other pills after eating when	- Food seeking in the absence of hunger (such as after a full meal), - Excessive eating, amount of food eaten is large at one time, - A sense of lack of control over eating, - Absence of purging (self-induced vomiting), fasting or excessive exercise

- In severe cases, the bones protrude through the skin, as there is hardly any body fat. - The skin may be dry and scaly. - Body hair is increased (excessive growth of coarse hair in women),	they are not needed - Dehydration, Electrolyte imbalance which can lead to kidney and heart failure	

You would have realized that certain characteristics are specific to each one of these disorders, which can help us in diagnosing and differentiating these specific disease conditions. In binge eating disorder, excessive eating is characteristic. 1 in 5 patients who binge may consume as much as 5000Kcal in a typical episode. The food usually eaten during a binge episode consists of all forbidden foods: chocolate, chips, cookies, cake, ice cream, pizza; food that is easy to eat and do not require any preparation.

But in children and teenagers, eating disorders can overlap. For example, some individuals may alternate between periods of anorexia and bulimia. Also people with eating disorders may struggle with one or more of the following psychological problems: distress, anxiety, feeling of helplessness, low self esteem, inability to concentrate, unable to engage in conversation and withdrawn. The reality behind these conditions is that the brain is literally unable to function properly due to the lack of nutrition available to the body. Thus knowledge of these signs/symptoms is critical. Understanding the signs, symptoms will help in identifying target symptoms and behaviors that will be addressed in the treatment plan. We will learn about the management of eating disorders later in this unit. Next let us look at the causative factors.

WHAT CAUSES EATING DISORDERS?

The exact cause of eating disorders is not known. But, it is thought to be multi-factorial in origin. The multidimensional causative factors may include: vulnerable personality; psychological conflicts – individual and family relationship; socio-cultural environmental

factors - cult of thinness, hazardous dieting, social class and race and finally genetic and constitutional factors.

The best-known environmental contributor to the development of eating disorders is the socio-cultural idealization of thinness. Young children start to express concern about their own weight or shape or about becoming too fat. Beauty and appearance anxiety are critical global issues and media and advertizing are key factor driving this concern. Pictures, television, magazines influence children's/adolescents concept of the ideal body shape, influencing them to want to lose weight and promoting unrealistic standard of beauty. This concern endures through life.

Teenage girls and boys use unhealthy weight control behavior such as skipping meals, crash dieting, fasting; smoking, excessive exercising. self-induced vomiting and taking laxatives. Dieting is important predictor of developing eating orders. It is important to note that those who diet moderately are 5 times more likely to develop an eating disorder and those who practice extreme restrictions. They are 18 times more likely to develop an eating disorder than those who do not diet. Multiple studies have found that dieting is associated with greater weight gain and increased rates of binge eating in both boys and girls.

Bullying, weight stigma has been identified as yet another factor. Overweight girls and boys are teased about their weight by peers or family members. Individuals report coping with weight stigma by eating more food. Weight teasing or weight-based victimization among youth thus predicts weight gain, frequent binge eating, are at increased risk for eating disorder symptoms, and are more likely to have a diagnosis of binge eating disorder. Weight stigma is also a significant risk factor for depression, low self esteem and body dissatisfaction among individuals.

Occupation/profession may also play a role. Athletes are at-risk, especially those competing in sports that tend to emphasize diet, appearance, size and weight, such as weight-class sports (wrestling, rowing, horseracing etc.) and aesthetic sports (bodybuilding, gymnastics, swimming etc.). Thought most athletes with eating disorders are females, but male athletes also are at-risk. Similarly dancers have a prevalence of anorexia 10 times that of general population

Further, it is possible that the disorders begin when there are disturbed family relationships or dysfunctional families, e.g., when the parents are not getting along or pretend to be getting along well with each other but are actually highly dissatisfied with their marriage. Such a family may be overprotective, rigid and too goal oriented. Some may have unusual interest in weight, food or shape of the body. The eating disorder for the child in such a family serves as a focus in order to bring control into an otherwise chaotic life. It is not clear how these factors lead to intense fear of being fat that is central to both anorexia and other eating disorders like bulimia.

Some factors leading to binge eating are highlighted in Figure 7.1. The other binge triggers include being alone, having unstructured time after going home (from school or work), boredom.

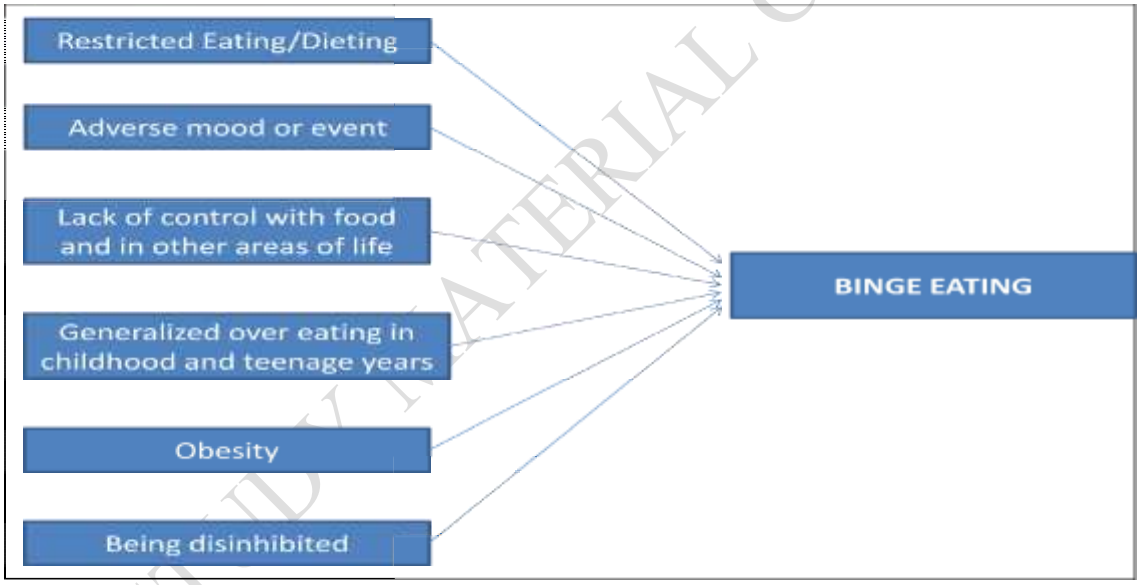


Figure 7.1: Risk factors to binge eating

Knowledge of these causative factors can play an important role in management of the disease condition. The next section deals with management of eating disorders.

MANAGEMENT OF EATING DISORDERS

The management of eating disorders should be a multidisciplinary approach. A multidisciplinary team comprising of a physician, nutritionist and psycho-therapists is usually involved in their management. The treatment of eating disorders can be said to have three components.

A) Medical and Biochemical Management

B) Nutritional Management, and

C) Psychological Management

Our focus in this unit will be only on nutritional management as psychological and medical management are not within our purview.

Nutritional Management of Eating Disorders

Here in this section we will consider the components of the management of anorexia nervosa and bulimia nervosa together, since the nutritional consequences and nutritional management for both these conditions are on similar lines. Malnutrition due to low or poor consumption of energy-giving macronutrients, such as carbohydrates, fats, proteins and/or micronutrients relative to individual needs is a concern with both anorexia nervosa and bulimia nervosa. In both the cases, consideration needs to be given to symptoms of the starvation syndrome. Starvation syndrome here refers to starvation caused either by food restriction/dieting as in anorexia nervosa or problems related to food absorption as in purging or excessive exercise may mean that insufficient energy is consumed for weight maintenance in bulimia nervosa.

The aims of nutritional management or dietetic treatment of eating disorder therefore should be to:

- establish a normal pattern of food intake,
- encourage a nutritional intake appropriate to the individual's needs, and
- maintain a body weight within a normal range

In severely malnourished/underweight patients the goals of nutritional therapy should be to restore weight, normalize eating patterns, achieve normal perception of hunger and satiety and correct the biological aspects of malnutrition. We need to understand that in the severely malnourished patients, two separate but linked processes occur. First, inadequate food

consumption leads to wasting (tissue loss) and functional changes in all tissues. Second, the general metabolic response to infection, trauma or other stress results in further specific nutrient losses and cellular damage. Now starting to eat again after a period of prolonged starvation can precipitate problems and complications. Therefore, the first step has to be to repair the body. Tissue repletion is a secondary consideration. The energy needs of a patient with an eating disorder, therefore, are challenging to predict. The guideline for nutrient/diet therapy and nutrient intake for eating disorder patients are highlighted in Table 7.2.

Table 7.2: Dietary considerations and nutritional needs for eating disorder patients

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) *For Anorexia Nervosa patients*	*For Initial Phase:* - start at 30-40 Kcal/kg/per day i.e. approximately 1000 - 1600 kcal/day *Weight gainphase* - Increase daily intake by400-500 calories/ day. Advance progressively to 70-100 kcal/kg per day i.e. to 3000-3500 Kcal by the end of the month. *Weight maintenance Phase* - Provide 200-400 calories more than the recommended energy intake (specific to sex-, age-, weight-, and height).	- Avoid rapid refeeding of an individual in a state of starvation. *Simple tips to increase caloric intake to achieve a steady weight gain* i.e. 0.5–1.0 kg/week. - Increase the frequency of eating (from three times to six times a day) - Calorie count to target: A good initial rule of thumb is three 500- to 800-calorie meals plus at least three 300-calorie snacks - Increase energy dense food (add fat while cooking such as oil, butter, ghee which can increase calories without increasing portion size). - Slowly increase portion size - Supplement with liquid nutrition (high calorie drinks/supplements)
For Bulimia Nervosa Binge Eating Disorder Patient	Aim is to stabilize weight: - start at 30-40 Kcal/kg/per day i.e. approximately 1000 - 1600 kcal/day - Subsequently increasing to an intake corresponding to the estimated average requirement for the individual as recovery proceeds.	

Proteins (g) (15-20% of total calories to be provided by proteins)	Adequate protein intake (1g/kg body weight) to: -ensures proper metabolism -prevents muscle loss, and -provides for tissue repletion	Protein sources of high biological value (lean meat, fish, chicken, eggs etc.) need to be included in the diet. Cereal-pulse combination meals to be provided
Carbohydrate (CHO) (50-55% of total calories to be provided by carbohydrates)	Carbohydrates: - helpful in bowel movement.	It is important to include sources of insoluble fibre for optimal health and for relief from constipation.
Fats and Oils **(**25- 30% of total calories to be provided by total fat)	Dietary fat induces over consumption and weight gain through its: -low satiety properties, and -high caloric density.	Patients may have an aversion to fat, which makes weight gain difficult. Fat may therefore be included in the diet in a disguised form. For example, giving whole milk instead of toned milk. Add fat while cooking food such as oil, ghee, butter, cream.
Vitamins and Minerals (Meet the daily dietary recommended intake)	*Anorexic individuals* may have: - high rate of micronutrient deficiencies (namely thiamine, folic acid, vitamin C, iron, Zinc, selenium deficiency) -are at risk of developing deficiency of fat-soluble vitamins (such as Vitamin A, Vitamin D deficiency), *Bulimia nervosa* patients suffer from electrolyte (sodium, potassium, chloride, bicarbonate) imbalance due to purging behavior	- include 100% RDA multivitamin tablet with minerals - provide prophylactic thiamin supplements in oral form for those undergoing rapid weight gain - Provide 5-6 servings of cooked vegetables/fruits daily - Cut down on raw fruits and vegetables which can contribute to early fullness - Use oils fortified with vitamin A/D). - Correct fluid and electrolyte imbalance as advised.
Fluids (Liberal intake)	Liberal fluids intake is desired to: -compensate for the fluid losses in the body through purging/vomiting -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance	Fluid intake can be accomplished through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water. -Avoid rapid re-feeding or fluid overload.

The dietary considerations and recommendations provided in Table 7.2 may be used as basic guidelines for meeting the nutritional needs of patient suffering from eating disorders. Note, people with eating disorders are given a carefully prescribed diet, starting with small meals and gradually increasing the caloric intake. Each individual patient is given a goal weight range. As she/he approaches the ideal weight, more independence in eating habits is allowed. If, however, they fall below the set range, greater supervision may be reinstated. Patients are encouraged to monitor their intake and adopt structured eating i.e. eat 5-6 times per day (including 3 main meals, 2-3 snacks no closer than 2 hours together, no longer than 4 hours apart). All meals should have all macronutrients: carbohydrates, protein and fat. An illustrative 3000Kcal diet plan/menu is presented in Table 7.3 for your reference.

Table 7.3: Menu for a 3000 kcal diet for an eating disorder (anorexic) patient

Early Morning	Breakfast	Mid-Morning (Snack)	Lunch	Mid Afternoon (Snack)	Evening Tea (Snack)	Dinner
Milk shake (1 glass) OR Milk with any supplement like Ensure Nuts (8-10 pieces)	Paushtik Methi roti (2) OR Veg. yogurt sandwich (2) + Milk (1 cup)	Veg. Soup with cream and croutons (1 bowl)	Chapati (2)+ Fried Rice (1 katori) + Soya chunks curry (1 katori) + Vegetable (1 katori) + Raita(1 Katori)	Veggie pasta or Vegetable Upma (1 bowl)	Fruity Muffin OR Cup Cake (1) Milk(1 Cup)	Chapati (4) Dal (1 katori) Aloo Gobhi Sabji (1 katori) Mint chutney Cuatard or Sewiya (1 bowl)

The menu involves 3 meals per day and some snacks as appropriate with foods incorporated from all food groups to promote optimal nutrition. Based on the likes, dislikes of the patient the meals may be altered provided they are balanced.

Remember, *nutrition counseling/education* is an important component in the care/treatment of eating disorders. Nutrition counseling can be used to accomplish a variety of goals, such as reducing behaviors related to the eating disorder, minimizing food restrictions, correcting nutritional deficiencies, increasing the variety of foods eaten and encouraging healthy and not excessive exercise pattern.

Along with nutritional management you have learnt that psychological management is very important in eating disorder treatment. *Psychological management* targets at cognitive and behavior interventions. Psychological cognitive intervention targets unhealthy attitudes such

as body dissatisfaction and body image distortion. Behavioral interventions focus on problematic behaviors such as fasting, vomiting/purging and overeating. These psychological interventions also focus on the promotion of self-esteem, the development of stress management skills and the encouragement of healthy weight-control behaviors. It also considers the change in children's perceptions about the thin ideal promoted by the media and on developing children's ability to realistically assess what constitutes a healthy body shape and size.

Some do's and don'ts related to management of eating disorders are highlighted herewith. Remember eating disorders are long term illnesses and people recover slowly. Be patient and encourage the patient not to give up.

Do's	Don'ts
- Educate yourself about the eating disorder. This will equip you to help those around you suffering from the problem - Family support is extremely important, especially in helping the recovering patient with everyday tasks. Educate the family, friends regarding the disorder and encourage them to attend family counseling sessions. - Encourage the patient to seek medical help. But, don't be too forceful. This will make them more anxious - Encourage the person not to blame herself/himself or feel guilty or dwell on causes - Encourage the patient to attend support groups and read current literature - Encourage the patient not to skip meals or talk about dieting	- People with eating disorder are extremely self-conscious about their eating habits. Do not nag them about eating or not eating. This will reinforce the behavior. - Do not blame or shame the person. - Do not hide food to keep the person from binge eating. This will create resentment - Do not force the person to eat. This will make them feel out of control or childish. This will reinforce the behavior - Don't comment positively or negatively on appearance, shape or weight.

Unit 2

DIARRHOEA

(TYPES, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define diarrhoea and review the different terminologies used in the context of diarrhoea,
2. differentiate between different types of diarrhoea,
3. explain the causes, clinical symptoms and the metabolic changes during diarrhoea, and
4. describe the diet therapy during diarrhoea.

We have looked at the basic concepts and inter-relationship between fever, infection and nutrition in our study so far. Diarrhoea, an infection, is an important public health problem among under-five children in developing countries. Recent evidence suggests that diarrhoea is the third leading cause of childhood mortality in India, and is responsible for 13% of all deaths/year in children under five years of age. Do you know what diarrhoeal diseases are? What causes it? What are the symptoms and how can we prevent and treat it? Yes, diarrhoea is both preventable and treatable. This Unit will focus on the classification/terminologies, determinants, preventive and control strategies of diarrhoea and equip you with dietary principles for management of diarrhoea at home or in a community setting.

DIARRHOEA: DEFINITION, CAUSES and SYMPTOMS

What is diarrhoea? As per the World Health Organization (WHO), diarrhoea is defined as the *passage of three or more loose or liquid stools per day* (or more frequent passage than normal for the individual).

Now consider the following cases.

Case 1: Rani is a 2 year old girl. She has a history of frequent passing of stools but they are well formed. As a baby who was breast fed, even then, Rani use to pass loose "pasty" (semi formed) stools. Her mother is worried.

Case 2: Ramu is a 2 year old boy. He has a 2 day history of watery diarrhoea. His mother informs that he has had several episodes of loose motions with 4-5 loose liquid stools passed per day.

In your opinion are the two children suffering from Diarrhoea? Before you jump to any conclusion, please read the definition of diarrhoea once again more carefully.Then comment on each case.

Yes, what does the definition state? Diarrhoea is the passage of three or more liquid or watery stools in a day. Here the *consistency and character of stools* rather than the number of stools alone is critical.

Now, considering the two cases mentioned above, Ramu is more likely to be suffering from diarrhoea as his stools are liquid, watery and off course frequent. Rani, though was passing frequent stools but the stools were well formed. Hence, she is not likely to be suffering from diarrhoea. Remember, Diarrhoea is characterized by the frequent passage of liquid stools, which is accompanied by excessive loss of fluids and electrolytes, especially sodium and potassium. Diarrhoea, is a symptom and not a disease. This must be clear to you.

While studying about diarrhoea, you may come across other terminologies/terms such as acute watery diarrhoea, dysentery, persistent diarrhoea used in context of diarrhoeal diseases. Do they mean the same as diarrhoea? Let us review.These terminologies are defined in box 1.

BOX 1: Terminologies used in context of Diarrhoea

Acute Watery Diarrhoea: Acute watery diarrhoea is the same as Diarrhoea, which is the passage of three or more liquid or watery stools in a day. It is the recent change in consistency and character of the stools rather than the number of stools that is more important. The duration of acute diarrhoea forms a continuum, most episodes terminating within 7 days and last no longer than 14 days.

Dysentery: Dysentery is referred to as *bloody diarrhoea*. The clinical syndrome of dysentery is characterized by the presence of blood and pus in the stools, abdominal cramps and fever.

Persistent Diarrhoea (PD): The most commonly used clinical definition of persistent diarrhoea is an episode which starts acutely but lasts for 14 or more days.

Having reviewed the terminologies, you may have noted that acute and persistent diarrhoea are not two separate diseases but form a continuum. Most episodes of diarrhoea last less than one week, but a small proportion of episodes last for two or more weeks. So we may consider as there are three clinical types of diarrhoea as also highlighted in Figure 1:

- Acute watery diarrhoea – last several hours or days,
- Acute bloody diarrhoea- also called dysentery, and
- Persistent diarrhoea – lasts 14 days or longer.

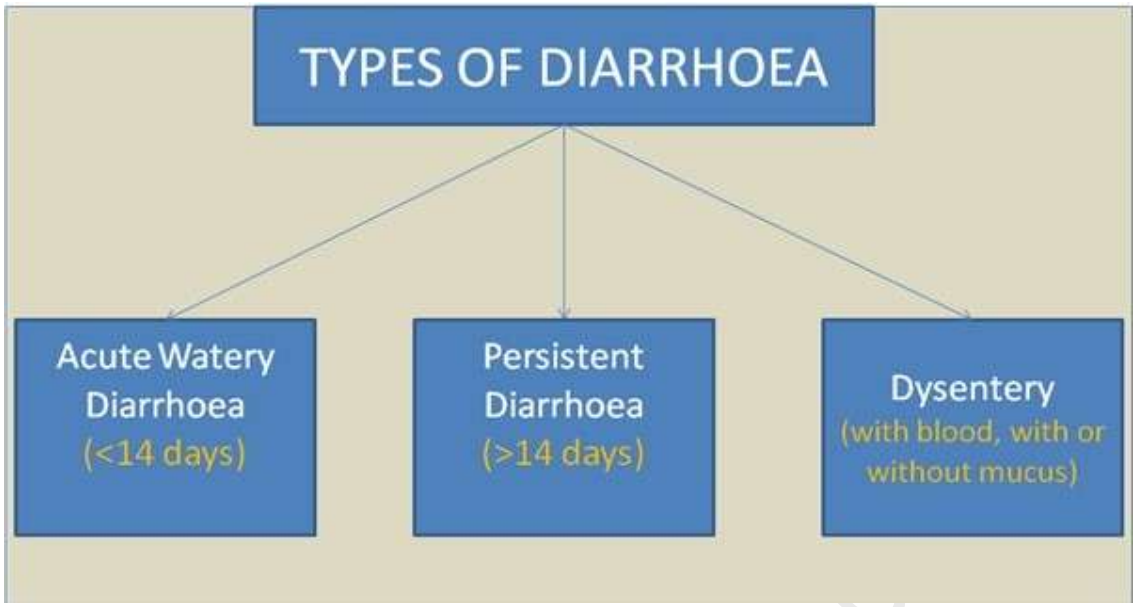


Figure 1: Types of diarrhoea

An episode of diarrhoea can be acute (recent origin) or chronic (extended duration and repeated episodes) in nature. Have you ever suffered from diarrhoea? What symptoms did you experience? Let's consider.

Symptoms of Diarrhoea

Yes you may have experienced watery stools, weakness, dizziness, dryness of mouth and anorexia. Diarrhoea is associated with symptoms depending on the cause and who is affected. Common symptom, however, include:

- Watery, thin or loose stools
- Abdominal cramps
- Sense of urgency to have a bowel movement
- Nausea and vomiting

In addition to the symptoms described above, the symptoms of severe persistent diarrhoea include:

- Dehydration
- Blood, mucus, or undigested food in the stool
- Weight loss
- Fever

Diarrhoea can be life-threatening! During diarrhoea, the stools have high water content – an indicator that water is being lost in higher than normal amounts. The stools also contain a high amount of electrolytes (sodium, potassium). This results in the deficiency of water and

electrolytes in the body which is referred to as *dehydration.* It is important that caregivers recognize the sign/symptoms of dehydration that require immediate attention. Children are at great risk than adults of life-threatening dehydration. Why? Because water constitutes a greater proportion of children's body weight, so dehydration occurs early. Child can loose 5ml to 200ml liquid in 24 hours. Also metabolic rate is high and use more water as compared to adult. So how do we recognize dehydration? A review on how to determine the dehydration status is presented under treatment and management of diarrhea in the next section.

It is important for you to understand that the two main dangers of diarrhoea are malnutrition and death. Do you recall our study in Unit 2 regarding the relationship between infection and malnutrition? We studied that infection adversely affects nutritional status through reductions in dietary intake and intestinal absorption, increased catabolism and depletion of nutrients that are required for tissue synthesis and growth. So Diarrhoea, which is an infection, is strongly associated with diminished food intake. Acute, repetitive, or chronic infection then invariably causes some degree of nutrient losses due to associated anorexia, catabolism of nutrient stores, and malabsorption due to intestinal infection, thus predisposing to malnutrition. Diarrhoea impairs weight as well as height gain leading to poor nutritional status. Children are particularly more vulnerable.

By now, you must have understood the consequences of diarrhea/dehydration and can appreciate that it is the highest cause of illness and death especially in children. So an understanding on what causes diarrhoea needs urgent attention. Let's review the etiology next.

Causes of diarrhoea

Diarrhoea, as must be evident to you by now, is usually a symptom of bowel infection. The infection may be caused by a wide range of pathogens, including bacteria, viruses and protozoa. These include:

- Bacteria, such as *Campylobacter, Clostridium difficile* (C. difficile), *Vibrio cholerae* (causing cholera) (*Escherichia coli* (E. coli), *Salmonella* and *Shigella*: they all may cause food poisoning
- Virus, such as a Norovirus or Rotavirus
- Parasite , such as the *Giardia intestinalis*, that causes Giardiasis

Infection is spread through contaminated food or drinking-water or from person to person as a result of poor hygiene. Poverty, ignorance, poor sanitation is often the underlying risk factors Diarrhoea caused by contaminated food or water while travelling is often known as traveller's diarrhoea.

Recognizing the ill-effects, management of diarrhoea, particularly in the context of management of dehydration and malnutrition is crucial which is discussed next.

TREATMENT AND MANAGEMENT OF DIARRHOEA/DEHYDRATION

You must have realized by now that diarrhea/dehydration should not be neglected and must receive prompt medical care to minimize the frequency of morbidity and mortalities. In light of the complications discussed above let us now examine what should be the objectives in the management of diarrhoea and more specifically dehydration.

Objectives: The major objectives in the management of diarrhoea include:

1. Fluid and electrolyte replacement
2. Removal of cause (especially if infection)
3. Nutrition concerns

The therapy for diarrhoea thus consists of:

1. Determining the status of dehydration
2. Fluid management
    - Oral Rehydration Therapy (ORT) - home made/commercial Oral Rehydration Salts (ORS)
    - Emergency treatment and drug management
3. Nutritional management

Let us review each of these therapy individually. The first step in diarrhea management is to determine the status of dehydration. Let us consider this.

Determining the status of Dehydration

How can we identify dehydration in an individual suffering from diarrhoea? What are the sign/symptoms to look for to identify dehydration? Table 4.1 and Figure 2 present the sign/symptoms of dehydration.

Table 4.1: Recognizing dehydration

Dehydration status	Sign/Symptoms
Some dehydration	Two of the following signs: • Restless, irritable • Sunken eyes • Drinks eagerly, thirsty • Skin pinch goes back Slowly
Severe dehydration	Two of the following signs: • Lethargy or unconscious • Sunken eyes • Not able to drink or drinking poorly • Skin pinch goes back very slowly

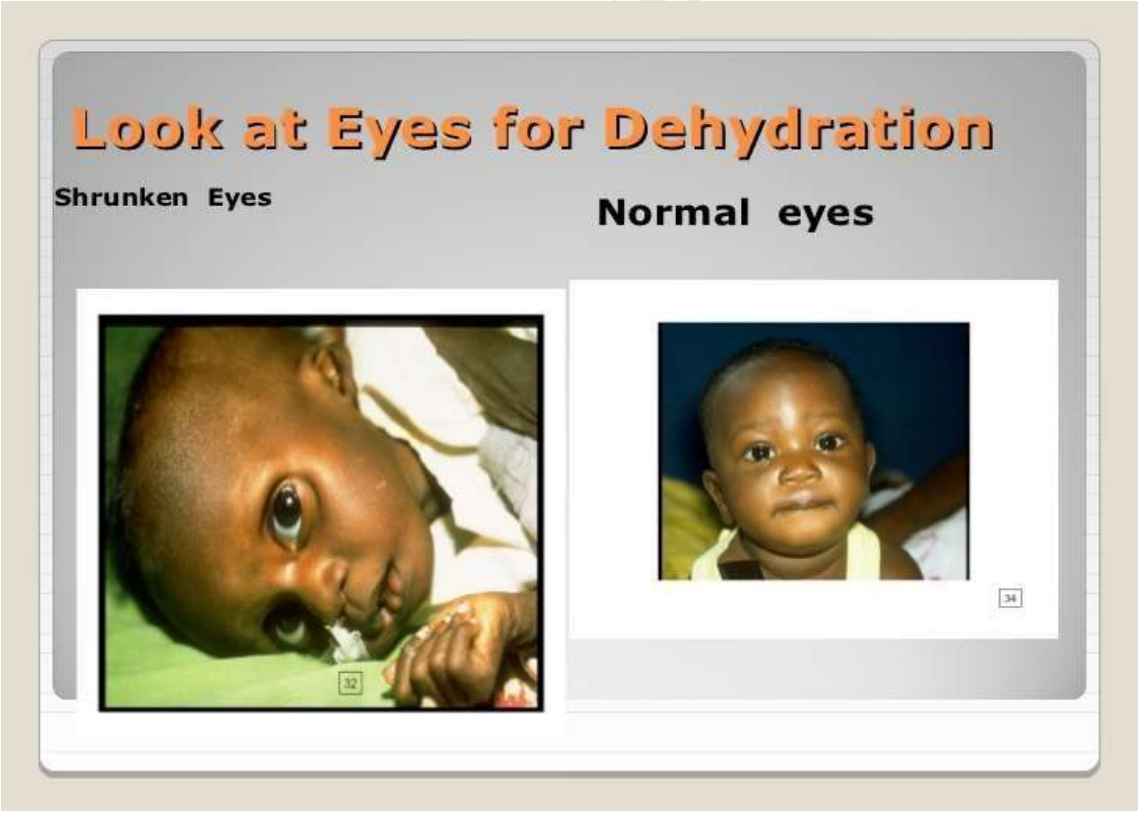


Figure 2a: Sunken eyes - a sign of dehydration

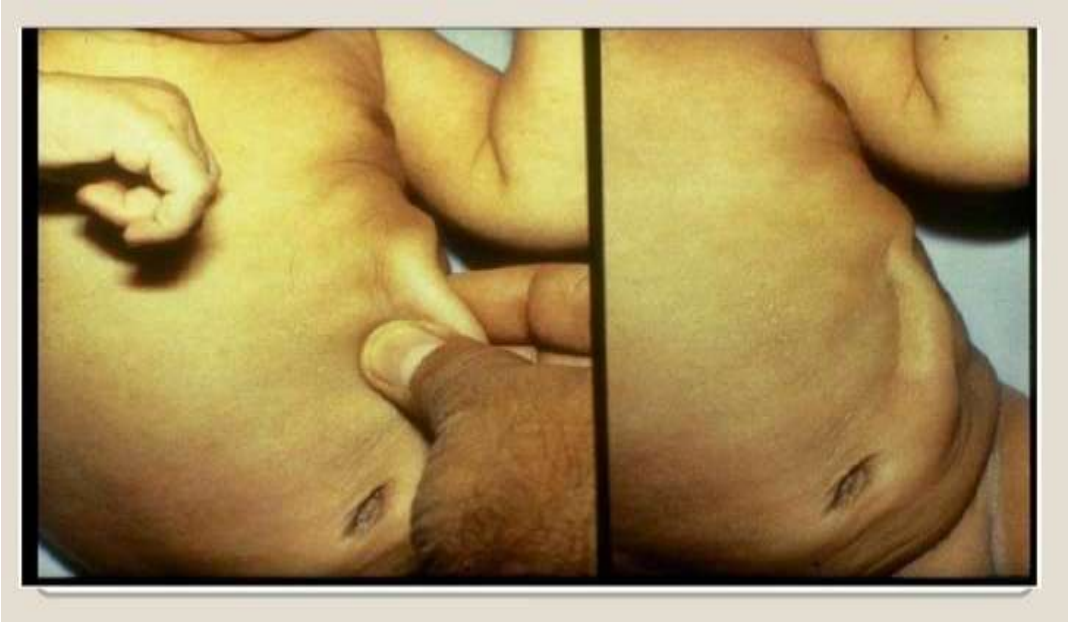


Figure 2b: Skin pinch - goes back slowly

So next time you have a bout of diarrhoea or come across an individual suffering from diarrhoea, look out for the sign and symptoms of dehydration. Look at the individual's general condition. Is he/she lethargic or unconscious, restless or irritable? Look for sunken eyes (Refer to Figure 2a). Look for skin pinch (Refer to Figure 2b). Does the skin go back promptly, slowly or very slowly? Offer the individual fluid to drink. Is he/she not able to drink or drinking properly? Drinking eagerly indicates thirsty. Based on these signs and symptoms, decide on the degree of dehydration. If an individual does not show enough signs to classify as some or severe dehydration than the person does not suffer from dehydration.

Once status of dehydration is identified, the plan of treatment is worked out. Next step deals with fluid management. Note, Oral Rehydration Therapy (ORT) is at the core of management of dehydration/diarrhoea. A review on the use of ORT and the fluid therapy in the management of dehydration is presented next.

Fluid Therapy/Oral rehydration therapy

The key to diarrhoea management is the early replacement of fluid lost in the stools through intravenous or oral route (by mouth). Oral Rehydration Therapy (ORT) is at the core of management of diarrhoea. A review on the use of ORT and the fluid therapy in the management of dehydration is presented in this section.

First let us understand *what is ORT?* Oral rehydration therapy is a simple treatment for dehydration associated with diarrhoea. The term ORT includes:

- Complete oral rehydration salts (ORS) solution,
- Solutions made from sugar and salt,
- Food based solutions, and
- Home fluids without insisting on specified amounts of glucose and salt.

Let us review each of them.

The term ORS refers to the complete *oral rehydration salt* mixture. ORS is potentially the most important medical advance of this century. It is safe, effective and cost saving. ORS can alone successfully rehydrate 95-97% individuals with diarrhoea. A single universal ORS solution containing: sodium - 75 mmol/l and glucose - 75 mmol/l, osmolarity 245 mosmol/l is recommended for all ages and all types of diarrhoea.

How much of ORS to give for replacement of ongoing stool losses to maintain hydration? Refer to Table 4.2 for easy reference.

Table 4.2: ORS guidelines for replacement of ongoing losses to maintain hydration

Age	After each liquid stool, offer
< 6 months	Quarter glass or cup * (50 ml)
7 months to less than 2 years	Quarter to half glass or cup * (50-100 ml)
2 up to 10 years	Half to one glass or cup* (100-200 ml)
Older children and adults	As much as desired

* Large tea cup

Besides ORS, other oral rehydration therapies can also be used and recommended, when ORS is not available. These other oral rehydration therapies are presented in Table 4.3.

Table 4.3: Other oral rehydration therapies*

	Composition per litre	Appropriate use
Home made fluids Sugar and salt solution (SSS)	Sugar (Sucrose) 40g Salt (NaCl) 4g	Prevention of dehydration
Food based solutions Rice water* with salt Dal or dal water with salt Butter milk (Lassi) with salt Soups with salt	Rice approximately 50g (precise measurement not required) Salt 4g	Prevention of dehydration

Home fluids Plain water, lemon water, coconut water, soups Thin rice kanji, dal water without salt	Without insisting on both a glucose precursor and salt or their presence in specified amounts	Prevention of dehydration; most useful in presence of continued feeding which provide both absorbable substrate and some salt.
WHAT IS NOT ORT?		
Glucose water without salt. Fluids without starch or sugar and salt in children/other individuals who are starved. Fluids consumed in very small quantities e.g. plain tea, herbal tea, medicinal concoctions.		

* May be used for treatment of dehydration when ORS is not available.

Source: Revised guidelines for management of diarrhoea in children for medical officers and health workers. Ministry of Health. Government of India.2007.

We hope you have got a good insight about ORT and the various options. Here we would also like to emphasize that, while ORS remains the mainstay of therapy during acute diarrhoea, *zinc administration* during and after diarrhoea, has an additional benefit in reducing duration and severity of diarrhea, especially among children. The therapeutic benefit in acute diarrhea may be attributed to the effect of zinc on the various components of the immune system and its direct gastrointestinal effects.

The recommendation for use of zinc supplementation (in diarrhoea) includes:

- All cases of diarrhoea should receive zinc in addition to ORS. A uniform dose of 20 mg of elemental zinc should be given during the period of diarrhoea and for 7 days after cessation of diarrhea to children older than 3 months.

NUTRITION MANAGEMENT OF DIARRHOEA

Diarrhoea we know worsens nutritional status, especially in case of children. The nutritional status is affected because of:

(a) decreased food intake due to anorexia and maternal food withholding, and

(b) intestinal malabsorption of macronutrients and of some micronutrients.

You may have noticed that in some household's mothers tend to fast the child during diarrhoea in the misconception that feeding will cause more diarrhoea. There is no basis for this fasting. In fact, the role of diet in the management of diarrhoea is quite crucial and beneficial. Children should continue to be fed during acute diarrhoea because feeding is very important and prevents or minimizes the deterioration of nutritional status that normally accompanies such illness. Feeding prevents malabsorption and facilitate mucosal repair. It prevents growth faltering and malnutrition.

While the demand for fluids and electrolytes are particularly high during an acute episode as already highlighted above. The demand for all macro and micronutrients increases during chronic diarrhoeas. The nutrient requirements and or the quality (consistency) of diet may not necessarily be the same for all forms of diarrhoea. Here we will focus on dietary management and nutrient intake during diarrhoea in general and then with particular focus for children.

Dietary Considerations and Nutritional Need during Diarrhoea

The diet should take into account the normal recommended dietary allowances and various adjustments made to the quantity and quality of the foods to be given. Table 4.4 highlights the dietary recommendations.

Table 4.4: Dietary considerations and nutritional needs during diarrhoea

Dietary requirements	Recommendation/Justification	Dietary Considerations
Energy (Kcal) (Carbohydrates and Fats) An increment of 200–300 Kcal in acute phase as per the tolerance of the patient.	High calorie diet: -minimizes the deterioration of nutritional status - prevents the weight loss that takes place due to illness - replenish the depleted stores of the body.	60-65% of the total energy should be provided by easily digested carbohydrates. Glucose, sugar, honey, jaggery, potato, yam, colocasia, rice, sago, semolina, refined flour, pastas can be incorporated to prepare dishes such as khichdi, vegetable/pulse puree, fruit juices, soufflé, shakes, custard and kanji. Excess sugar may be avoided. The fibre content of the diet should be minimum. Emulsified form of fats like cream, butter, ghee, egg yolk should be included as they are easily digested and well tolerated by patients. Fats help in increasing the energy density of the food without increasing the bulk of the diet. Fried food must be avoided.
Proteins (g) In chronic diarrhoea, an additional 10g of protein may be recommended above the normal requirements.	High protein diet compensates for: - massive loss of lean body mass (muscle) due to tissue (protein) breakdown.	Milk in the fermented form like curds is better tolerated, as it is easy to digest and helps in maintaining the gut health. Other cooked and diluted milk products like a light porridge; paneer etc can also be tolerated in small amounts. Apart from these, easily assimilated protein-

		rich foods like minced meat, egg, skimmed milk and its preparations can be given.
Vitamins (B Complex vitamins, especially folic acid, vitamin B_{12} and vitamin C. Fat soluble vitamins (A, D, E and K)	Vitamins need to be emphasized considering: - the increase in the energy requirements, - a decreased ability of the intestine to assimilate and synthesize some of the vitamin due to compromised digestive processes and altered microbial flora, - to boost immunity and favour wound healing, particularly vitamin C, and -for maintenance of epithelial mucosa (gut lining).	Vitamin supplementation may be given in the early stages of the infection when the patient is anorexic and has low food tolerance. Subsequently well cooked soft and pureed yellow and orange coloured fruits and vegetables such as pumpkin, carrots, mango, papaya, bottle gourd etc. may be included Food preparations in forms like stews, soups and dal water are beneficial.
Minerals (Sodium, Potassium, chloride and iron)	-To compensate for loss of electrolytes observed due to diarrhea, vomiting To compensate for iron (blood) loss associated with bleeding.	Liberalizing on sodium intake through salty soups, beverages are desired. Potassium intake can be increased by emphasizing cooked fruits, low fibre vegetables, washed and dehusked pulses. Potassium supplementation may favour bowel motility and build up appetite. Iron rich foods including tender meat and meat products, dehusked pulses may help meet iron needs.
Dietary Fibre (fibre content of the diet should be kept minimum and insoluble fibre should particularly be avoided)	Avoid high fibre foods: - to minimize the irritation of GI tract	Insoluble fibre in the form of skins, seeds and structural plant materials should be strictly avoided. Soluble fibre in the form of stewed fruits and vegetables like apple juice, stew, guava nectar and pomegranate juice help in binding the stool and favour good environment in the gut. Fruits like papaya and banana have an astringent property and are beneficial. Avoid foods with high fibre content such as whole grain cereals and their products like oatmeal, whole wheat bread, whole pulses and pulses with husk, green leafy vegetables and raw vegetables, fruits with hard skin in the form of salads.
Fluids	Liberal fluids intake is desired to:	Fluid intake can be accomplished

(Liberal intake to minimize risk of dehydration)	-compensate for the fluid losses in the body -ensure adequate volume of urine to eliminate wastes, and -prevent dehydration and maintaining water balance	through a variety of beverages, soups, juices, broths, dal, coconut water besides plain water. Preference must be given to diluted drinks as concentrated ones may favour diarrhoea.
Consistency of diet	Progressive diet needs to be followed:	-In the beginning a *full fluid diet* may be provided. -As the appetite improves bland, low fibre, soft diet, which is easily digested and absorbed, should be given. Well cooked, well mashed, sieved, bland, semisolid foods like khichdi, rice with curd, suji kheer, custard etc. may be given. Note: Small quantities of food at 2-3 hours interval will provide adequate nutrition without overtaxing the digestives system at any one time.

Besides the recommendations provided in Table 4.3, nutritional considerations for young children with diarrhoea need emphasis. WHO recommends a child with diarrhoea should continue to be fed. Continued feeding speeds the recovery of normal intestinal function. In contrast, children whose food is restricted have diarrhoea of longer duration and recovery of intestinal function is slow. Some handy points and guidelines are presented next.

Recommendations for dietary management of acute diarrhea in infants and children

1. In acute diarrhoea, breastfeeding should be continued uninterrupted even during rehydration with ORS.
2. Encourage the child to drink and eat. Be patient while feeding. Give foods that the child likes. Give a variety of nutrient–rich foods/ energy dense foods with the least bulk (fibre) and available in the household in small quantities but frequently, at least once every 2-3 hours.
3. Staple foods do not provide optimal calories per unit weight and these should be enriched with fats and oils or sugar e.g. khichri with oil, rice with milk or curd and sugar, mashed banana with milk or curd, mashed potatoes with oil and lentil.
4. Foods with high fibre content e.g. coarse fruits and vegetables should be avoided.

5. Do not dilute milk. In non-breast fed infants, cow or buffalo milk can be given undiluted after correction of dehydration together with semisolid foods. Alternatively, milk cereal mixtures e.g. dalia, sago, milk-rice mixture, can be used.
6. Routine Lactose-free feeding is not required. It may be required in very few infants in whom diarrhoea persists beyond 8-10 days with progressive weight loss.
7. Do not give sugary drinks.
8. During recovery, an intake of at least 125% of normal should be attempted with energy/nutrient dense foods (enrich food with fat and sugar). Feed an extra meal for at least 2weeks after diarrhea stops. Continue until the child reaches pre-illness weight and ideally until the child achieves normal nutritional status (as measured by expected weight for height or weight for age). This might take several weeks or longer, depending on the degree of deficit.

We end our study on treatment and Management of diarrhoea here. Note, proper treatment and management of diarrhoea is highly effective in preventing death, but has limited impact on occurrence of diarrhoea. So prevention is always better than cure. Simple preventive measures for diarrhoea are highlighted next.

PREVENTION OF DIARRHOEA

Now that you are an aware citizen, you should ensure that the mothers and all other individuals know about the basic diarrhoea prevention strategies. These include:

1. The babies under 6 months of age should be exclusively breastfed. This means that the healthy baby should receive breast milk and no other foods or fluids, such as water, tea, juice, cereal drinks, animal milk or formula. Breastfeeding should continue until at least 2 years of age.
2. Weaning practices for infants should be appropriate and age specific.
3. To prevent the spread of infections that cause diarrhoea, always maintain high standards of hygiene. For example:

- Clean water for drinking and washing should be used.
- Hand washing should be encouraged. Wash hands thoroughly before eating or preparing food and after going to the toilet.
- Latrines should be used. There should be quick and sanitary disposal of babies stools.

- Avoid sharing towels, cutlery or utensils with other household members.
- Avoid returning to work or school until at least 48 hours after the last episode of diarrhoea

4. Food safety practices should be emphasized including:

- Raw food should not be eaten except undamaged fruits and vegetables that are peeled and eaten immediately;
- Food should be cooked until it is hot throughout;
- Food should be eaten while it is still hot, or reheated thoroughly before eating;
- All cooking and serving utensils should be washed and thoroughly dried after use;
- Cooked food and clean utensils should be kept separately from uncooked food and potentially contaminated utensils; and
- Food should be protected from flies by means of fly screens.

5. Children should be given measles immunization.

Based on the guidelines presented in this Unit, we hope now you are in a position to manage a case of diarrhoea. You would realize when there is no sign/symptom of dehydration it is easy to treat diarrhoea at home. In case of children, home treatment can be crucial and here are four rules of home treatment.

TREAT DIARRHOEA AT HOME

The four rules of home treatment of diarrhoea among children include:

1. **Give Extra fluid**

   Advice the caretaker/mother to breast feed the infant frequently and for longer at each feed. If exclusively breastfed, give ORS for replacement of stool losses. If not exclusively breastfed give one or more of the following: ORS, food based fluid (soup, rice water, coconut water and yogurt drinks) and clean water.

2. **Continue feeding**

   Continue usual feeding, which the child was taking before becoming sick. Feed 5-6 times in a day.

3. **Advice to care taker/mother when to seek medical advice**

   Advice mother/caretaker to seek help immediately if the child has any of these signs: not able to drink, breastfeed or drinks poorly; becomes sick or has fever .

4. **Give oral zinc for 14 days.**

We end our study on Diarrhoea here. Some Do's and Don'ts, and a list of what foods to give and what foods to avoid are highlighted in Table 4.5. You may consult the list while planning the diet.

Table 4.5: Foods to include and foods to avoid during diarrhoea

Foods to include	Foods to avoid
1. Plenty of fluids like soups, coconut water, salt, sugar solution (electrolyte), barley water, lemon water, rice water, dal water, butter milk (lassi), plain water, 2. Bland, well cooked, well mashed, sieved, soft, semisolid foods like khichdi, rice with curd, suji kheer, custard etc. 3. Low fibre foods such as refined cereals and their products (e.g. maida, rava, bread, rice, noodles etc.) dehusked pulses (washed dals), well cooked/stewed fruits, vegetables in soft and puree form and potatoes. 4. Foods providing proteins of high biologic value e.g. eggs, soft cheeses, tender meats, fish, poultry etc.	1. High fibre foods like whole grain cereals and their products e.g. whole wheat flour, whole wheat bread, oats and cracked wheat, whole pulses and pulses with husk. 2. All raw vegetables and fruits with hard skin or fibre such as green leafy vegetables. 3. Simple sugar solutions 4. Fresh juices – Fresh or tinned. 5. Carbonated soft drinks 6. Tea, coffee 7. Gelatin desserts 8. Thick creamy soups 9. Fried fatty foods .

In addition to the list provided in Table 4.5, some do's and don'ts are summarized in Table 4.6. Make a note of them.

Table 4.6: Do's and Don'ts

Do's	Don'ts
1. Always wash vegetables and fruits with clean water before eating. 2. Wash hands frequently, particularly before eating or preparing food and after using the toilet. 3. Drink water that has been boiled, filtered and treated. 4. Eat small frequent meals. 5. Make sure the food (meat, fish or vegetables) whatever it is that you are eating has been thoroughly cooked and served steaming hot.	1. Avoid places that do not maintain hygiene. Avoid foods from street vendors 2. Do not buy open and cut fruits and vegetables from street vendors. 3. Do not eat unwashed or unpeeled fruits and vegetables. 4. Avoid excessive use of fat in cooking 5. Avoid eating foods served at room temperature. 6. Avoid using ice made from tap or well water or flavoured ice. 7. Avoid close contact or sharing eating utensils, cups with people who are infected.

UNIT 3

CHAPTER – 3 - JAUNDICE / HYPERTENSION (DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, COMPLICATIONS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this unit, the students will be able to:

1. define the term hypertension,
2. enumerate the risk factors in causation of hypertension,
3. discuss the complications and consequences of hypertension, and
4. describe the dietary management and prevention of hypertension with special emphasis on lifestyle modification.

Hypertension is fast becoming a common health problem in India, likely because people are adopting increasingly sedentary lifestyles and poor eating habits. In 2015-2016, the fourth Indian National Family Health Survey (NFHS-4) reported that the prevalence of hypertension among rural population (15-49 years of age) was 6-10% and 7-11% among urban population. It is important to note that men/women, young/old adults all are at risk of this problem and it is a major risk factor for coronary heart disease, heart failure, renal disease and other complications. What is alarming is the fact that hypertension is known as a silent killer. It often occurs without any symptom or warning signs until more serious problem arises. Modifying lifestyle factors is important for managing hypertension. In this Unit we will focus on which lifestyle practices are related to hypertension and what can be done to prevent and manage hypertension. But first a review on what is hypertension and what are the risk factors and consequences of this problem.

WHAT IS HYPERTENSION?

Hypertension is a health condition characterized by high blood pressure. Blood pressure (BP), as you may know, is the force of circulating blood against the inner walls of blood vessels. When blood travels through the blood vessels with more force than is considered healthy it is called hypertension. So how do we measure blood pressure? An instrument/devise called sphygmomanometer is used to measure BP. BP is measured in upper arm, using an appropriate cuff-size for the arm circumference.

For an average adult, a blood pressure reading is considered normal if it is below 120/ 80mm

of mercury (mmHg). Here, you may have noticed that blood pressure is expressed as two numbers. The first number (120 mm) represents the pressure when the heart contracts and is

referred to as "Systolic pressure (SBP)". The systolic measurement is the peak pressure in the arteries. The second number (80mm) represents the pressure when the heart relaxes (is at rest) between beats, called the "Diastolic pressure (DBP)". Diastolic pressure is the minimum pressure in the arteries. Recent guidelines have given the classification of blood pressure and the stages of hypertension (in adults) based on blood pressure values as highlighted in Table 8.1.

Table 8.1: Classification of blood pressure and the stages of hypertension

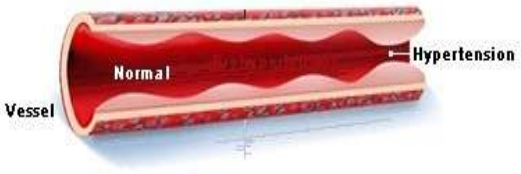
Blood Pressure Category	Systolic blood pressure (SBP)	Diastolic blood pressure (DBP)
Normal	<120 mm Hg	<80 mm Hg
Elevated	120–129 mm Hg	<80 mm Hg
Hypertension		
Stage 1	130–139 mm Hg	80–89 mm Hg
Stage 2	≥140 mm Hg	≥90 mm Hg
Hypertensive Crisis	≥180 mm Hg	≥120 mm Hg

It is recommended that BP be classified as normal, elevated or Stage 1 and Stage 2 hypertension based on SBP and DBP readings as highlighted in Table 8.1. A reading of SBP/DBP above 130/80 is diagnosed as hypertension. The categorization is important for the diagnosis, treatment and prevention of hypertension. Remember, high BP has no symptoms, until individuals begin to experience complications. These complications can be life threatening. What are these complications? What are the consequences of BP? The next section focuses on this aspect.

CONSEQUENCES, COMPLICATIONS OF HYPERTENSION

Hypertension is predominantly asymptomatic as already highlighted, and you would notice that it is best detected by opportunistic measurement of BP. High blood pressure which may go undetected can slowly over a long period of time damage the body before symptoms develops. Left uncontrolled, it can lead to a disability or a poor quality of life or even a fatal heart attack or sudden death. Consequences of hypertension are highlighted herewith:

Damage to arteries and blood vessels: Hypertension gradually increases the pressure flowing through the arteries leading to damaged or narrowed arteries. Once the arteries are damaged, when the fat from the diet enters the blood stream, they tend to get collected in the arteries, thus narrowing the lumen of the arteries, eventually leading to the artery walls becoming less elastic, limiting blood flow through the body. Over time, the constant pressure of blood in the weakened artery can cause a section of its wall to enlarge and form a bulge called eneurysm. This bulge can be life-threatening as it can potentially rupture causing internal bleeding and death. The diseases of the arteries resulting from the blockage of arteries are generally called coronary artery disease (CAD).



Blood vessel

Damage to heart: What is the function of the heart? Yes, the major function of the heart is to pump blood to the entire body. Uncontrolled blood pressure can damage the heart in a number of ways. First as you have already learnt, hypertension can damage arteries leading to coronary artery disease. It affects the arteries that supply blood to the heart muscles. When blood cannot flow freely to the heart, the individual can experience chest pain (angina), a heart attack or irregular heart beat or irregular rhythm (arrhythmias). Over time, the strain on the heart caused by high BP can cause the heart muscle to weaken and work less efficiently. High blood pressure then forces the heart to work harder than necessary in order to pump blood to rest of the body. This causes the ventricle to thicken and stiffen, limiting the ventricle ability to pump blood thus increasing the risk of heart attack, heart failure or sudden death. Signs of heart failure include: shortness of breath or troubled breathing, swelling in the feet, ankles, legs or abdomen, feeling tired.

Damage to Brain: Like the heart, the brain too requires constant supply of blood. Blood carries nourishing food to the brain so that it can work properly. Sometimes there can be a temporary disruption of blood supply to the brain caused by artery blockage or a blood clot both of which can arise from high blood pressure. Interruption of blood flow to the brain can lead to mild cognitive impairment or to *dementia*, a brain disease resulting in problems with thinking, speaking, reasoning, memory, vision and movement. Uncontrolled high BP can damage and weaken brain's blood vessels causing them to narrow, rupture or leak leading to forming blood clots in the arteries (leading to the brain) blocking blood flow causing s*troke*. Stroke is a condition when part of the brain is deprived of oxygen and nutrients, causing brain cells to die.

Damage to Kidneys: Major function of the kidneys is to filter extra fluids and waste from the blood - a process that depends on healthy blood vessels. Like the blood vessels in the brain and the heart, high BP can damage large arteries leading to kidney and the tiny blood vessels within the kidney. As a result kidneys are unable to filter extra fluid, waste; thus dangerous levels of these accumulate leading to kidney failure.

Damage to Eyes: You may have noticed the tiny blood vessels supplying blood to the eyes. Like other blood vessels these too can be damaged due to high BP. Blood vessels supplying blood to the retina (membrane that lines the inner surface of the back of the eyeball) when damaged can lead to bleeding in the eyes, blurred vision and complete loss of vision.

Sleep Disorder: Have you noticed that some people experience loud snoring and breathing interruptions during a night's sleep. This condition is called sleep apnea. People with sleep apnea often don't feel rested when they wake up in the morning. Research has linked this condition to high blood pressure.

High blood pressure during pregnancy can lead to complications such as *preeclampsia*. It is marked by high blood pressure in women who haven't had high blood pressure before.

Having gone through the complications, you are now aware that high BP is a risk factor for cardiovascular disease (CVD). CVD is the term for all types of diseases that affect the heart or blood vessels, including coronary heart disease (clogged arteries) which can cause heart attack, stroke or heart failure. In person's age 30 years and above, higher SBP and DBP are associated with increased risk of CVD, angina, myocardial infarction, heart failure and stroke.

It is also important to screen for and manage other risks factors in adults with hypertension. These risk factors are highlighted next.

RISK FACTORS OF HYPERTENSION

The factors that play a role in causing or increasing the risk of getting a disease are called risk factors. Table 8.2 highlights the risk factors for hypertension. Smoking, diabetes, elevated lipid levels (high cholesterol, triglyceride), excessive weight, low fitness, unhealthy diet, psychosocial stress, sleep disturbances are some of the risk factors. In Table 8.2 you may have noticed that these factors are categorized as *modifiable* and *non-modifiable*. Factors that can be changed and if changed may reduce the risk of other diseases are categorized as modifiable. Unhealthy diet, physical inactivity/low fitness, obesity are all modifiable factors.

On the other hand, factors that are difficult to change such as chronic kidney disease (CKD), low socioeconomic/educational status etc., OR cannot be changed (family history, increased age, male sex), or, if changed through the use of current intervention techniques, may not reduce other disease risk (CVD risk) such as psychosocial stress are non-modifiable risk factors.

Table 8.2: Risk Factors Common in Patients with Hypertension

Modifiable Risk Factors	Relatively Fixed/Non-modifiable Risk Factors
• Cigarette smoking, secondhandsmoking • Diabetes mellitus • Dyslipidemia/hypercholesterolemia • Overweight/obesity • Physical inactivity/low fitness • Unhealthy diet	• CKD • Family history • Increased age • Low socioeconomic/educationalstatus • Male sex • Obstructive sleep apnea • Psychosocial stress

Dietary factors are an important determinant of development and progression of hypertension. It is one of the important modifiable risk factors for hypertension. Unhealthy diets consisting of high fat, salt, sugar (HFSS) foods are the main culprit. Most commonly consumed HFSS foods include: chips, fried foods, sugar sweetened carbonated and non-carbonated beverages, pizzas, burgers, ready-to-eat noodles, potato fries, and confectionery items. There is a strong association between salt intake and blood pressure. Excessive salt intake has been associated with increased prevalence of hypertension and a rise in SBP with age. Excessive sodium intake can cause body to retain fluid and also cause arteries/blood vessels to constrict, which increase blood pressure. Also a diet high in calories, saturated fats {ghee, butter, food rich in animal fat (such as whole milk, red meat, organ meats), trans fats (deep fried snacks/foods, bakery products etc.) and processed, packaged foods such as chips, cookies etc.},carries an additional risk of hypertension. Packaged and processed foods often have sodium added during manufacturing either as salt or as baking soda.

Evidence suggests consumption of HFSS food is steeply increasing in rural and urban India. Easy availability, taste, low cost, aggressive marketing, advertising makes them popular with children and adults. HFSS foods are considered unhealthy due to imbalance in nutrients i.e. high in fat, sugar, salt and/or low in proteins, fibres and nuts.

Hypertension is often present in individuals who are overweight and obese In fact, hypertension is strongly associated with high body mass index (BMI). More the weight, more the blood flow required to supply oxygen and nutrients to the tissues. As the volume of the blood increases so does the pressure inside the arteries. Hence people who are obese are likely to have higher blood pressure. Further, overweight/obese children are more likely to develop (as compared to non-overweight children) insulin resistance, diabetes, cardiovascular diseases, including hypertension at an early age, which in turn are associated with a higher chances of premature death and disability.

Physical inactivity or low fitness also increases the risk of obesity along with hypertension. Regular exercise increases blood flow through arteries and release substances that relax blood vessels, which in turn lower blood pressure. Remember, sedentary lifestyle devoid of exercise increases the risk of blood pressure. Along with sedentary lifestyle, smoking, tobacco intake is other modifiable risk factors. What must be emphasized here is that these factors also make elevated blood pressure difficult to control despite progressively increasing doses of medication. Hence lifestyle/dietary management is important for such patients in order to avoid drug dependency. Next section focuses on management of hypertension.

MANAGEMENT OF HYPERTENSION

Having looked at the risk factors, it must be evident to you that hypertension is to quite an extent a lifestyle disease condition. Therefore behavior modifications pertaining to food choices and lifestyle patterns can help control high blood pressure and reduce the risk of life-threatening complications. Individuals who cannot maintain near normal levels of blood pressure despite lifestyle modifications are prescribed medication.

Dietary/nutritional management is the cornerstone of hypertension management. We will focus on this aspect in more details here.

Nutritional Management of Hypertension

We begin our study of nutritional management by first identifying the goals or objectives of nutritional management of hypertension

The main objective of dietary management of hypertension is to:

- Achieve gradual weight loss in overweight and obese individuals and maintain weight slightly below the normal level,
- Reduce sodium intake and maintain fluid and electrolyte balance,

- Maintain adequate nutrition, and
- Slow down the onset of complications

To meet these objectives the dietary recommendations and nutrient intake for hypertension are highlighted in Table 8.3.

Table 8.3: Dietary considerations and nutritional needs for hypertension

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) *For normal weight individual* *For Overweight individual* *For obese individual*	Provide enough calories so as to maintain ideal body weight Weight reduction: *Moderate deficit diet* 1. 1200- 1500 Kcal/day for women, and 2. 1500-1800 Kcal/day for men *Low-Calorie diet* 1. 1000 -1200 Kcal/day for women, and 2. 1200- 1500 Kcal/day for men	Excess calories through fats and carbohydrates have to be reduced so that the weight is maintained
Proteins (g) (15-20% of total calories to be provided by proteins)	Adequate protein intake (1g/kg body weight) to be provided Prefer protein from plant sources over protein from animal sources.	- Cut down on animal protein sources such as red meat, egg yolk, organ meat, whole milk, processed foods such as sausages etc. -Lean meat such as fish, poultry (baked and steamed) should be the preferred option in case of animal foods. - Vegetable proteins (nuts, seeds and pulses, legumes), Cereal-pulse combination meals should be preferred - Unsalted nuts and seeds may be provided.
Carbohydrate (CHO) (60-**6**5% of total calories to be provided by carbohydrates)	Carbohydrates: - provide energy and help in bowel movement.	Include complex carbohydrates rather than simple sugars. - Complex carbohydrates from vegetables, fruits, whole grains such as whole wheat, oatmealm legumes may be preferred - Foods such as potatoes, breads, noodles, pasta and those made from refined flour (maida) such as

		cakes, cookies, pastries etc. may be restricted. - Sugar, jaggery, candies, chocolates etc. should be strictly restricted. - Sugar containing beverages avoided
Fats and Oils (Not more than 20% of total calories to be provided by fat and oils)	Limit Dietary fat. Intake of saturated fats should be reduced to less than 10% of total energy consumption, and trans fatty acids to less than 1%. Dietary fat induces overconsumption and weight gain through its high caloric density.	- Vegetable oils (mustard, olive, soyabean, corn, sunflower oil) should be given preference. - All saturated fats such as ghee, butter, margarine, cream, hydrogenated fats must be restricted or best avoided, - Foods rich in saturated fats such as red meats, organ meat (liver, kidney), whole milk, processed, packaged foods should be avoided. - Fried foods/snacks, bakery products (cakes, cookies) containing trans fats should be strictly avoided.
Vitamins and Minerals (Meet the daily dietary recommended allowances. Intake of minerals and electrolytes is associated with maintenance of blood volume.	Sodium, potassium, calcium are three minerals of clinical significance. Sodium occurs naturally in foods or may be added to foods during manufacturing (as salt or as baking soda). Common table salt we use at home is combination of sodium and chloride. By weight it is 40% sodium and 60% chloride. For reference, one teaspoon of salt (5g) contains about 2,300 mg of sodium.	*Excessive sodium intake is associated with hypertension*. Depending on the severity of hypertension following sodium restriction is advised: - *Mild sodium restriction*: 2-3 g (2000-3000mg) sodium. Salt may be used lightly for cooking but no salt at the table is allowed. - *Moderate sodium restriction*: 1g (1000mg) sodium. While cooking no salt to be added and no salt used at table. - *Strict sodium restriction*: Only 0.5 g (500mg) sodium. While cooking no salt to be added and no salt used at table. Table 8.4(a) presents a list of high sodium and low sodium foods. 70% of the sodium in the diet comes from processed, pre-packaged foods. Avoid these. *Increasing Potassium in the diet lowers the blood pressure*. - List of Potassium rich foods is provided in Table 8.4(b). Increase food and vegetables in the diet. Provide 5-6 servings of vegetables/fruits daily.

		Ensure adequate calcium intake by including milk and milk products (low fat, skimmed), green leafy vegetables, cereals and pulses.
Fibre	30-40g/day	Include fibre containing plant foods -Whole wheat flour(with bran) - Whole legumes, pulses, - Fresh raw fruits (with edible skin) and vegetables (which can be taken raw)
Fluids (Adequate intake as per requirement)	Fluids restriction is necessary only if oedema (accumulation of fluid) is present	Fluid intake can be accomplished through a variety of beverages, fresh vegetable soups, juices, broths, dal, coconut water besides plain water.

Table 8.4(a) : High and low sodium content foods

High sodium content foods	Low sodium content food
- Pizza, instant soups, burgers, buns, rolls, sandwiches, biscuits, cookies - Processed foods like ham, sausages, cold cuts of meat, - Processed cheese - Savoury snacks (namkeen, samosa, pakora, chips, french fries, salted popcorn etc.), - Sauces, tomato ketchup, gravies, curry powders, papad, pickles, chutneys, salad dressings, sandwich spreads, - Ready-to-eat cereals, cakes, pies, patties. - Whole full fat milk, - Canned vegetables and canned meat/fish, frozen packaged meals/foods. - Organ meat (liver, kidney, brain), crabs, prawns. - Proprietary drinks such as bournvita, horlics, chocolate drinks	- Unprocessed whole foods like cereal grains such as whole wheat, wheat flour, oats, vermicelli, jowar, bajra, brown rice, rice flakes; all pulses, dried beans and peas - Fresh fruits like apples, oranges, banana, pears, berries etc. - Fresh green leafy vegetables and other vegetables such as spinach, fenugreek leaves, mustard leaves, carrots, spinach, cauliflower, pepper, capsicum etc. - Roots and tubers such as colocasia (arbi), potato, sweet potato, radish etc.. - Unsalted Nuts (almonds, walnuts, cashew etc.) and oilseeds - Fresh fish, chicken, lean meat - Fat free or low fat milk, yogurt, soymilk. - Vegetable oils (soybean, corn, canola, sunflower, olive oil. - Seasonings such as herbs, spices, garlic, ginger, onion, lemon and lime juice.

Table 8.4(b) : Potassium content of some food items

Food Groups	High sources of potassium (>300 mg/100 g)	Medium sources of potassium (200-300 mg/100 g)	Low sources of potassium (< 200 mg/100 g)
Fruits	Avocado, Banana, Dried fruits, Kiwi, Apricot, Dried Orange/prune juice	Berries, Grapes, Lemon, Peaches, Plum, Pineapple, Watermelon, Cherries	Mango, Papaya, Orange, Apple, Litchi
Vegetables	Dried beans, Potato, cooked spinach, sweet potato, vegetable soup, cauliflower	Tomato, Cabbage, brinjal, Green beans, Lettuce, Onions, Peas, Bitter guard (short), Pumpkin (Orange, round)	Bottle gourd, Pumpkin (green, cylindrical), Cucumber
Dairy	Khoa, Yoghurt, Ice-cream	Rice milk, Non-diary whipped toppings	Milk, Paneer
Snacks	Chocolate, Seeds & Nuts, Salt substitutes	Jelly, Hard candies, Plain Doughnut, unsalted popcorn	-

The dietary requirements/considerations provided in Table 8.3 and the sodium/potassium content of some common foods given in Table 8.4 would surely guide you in selecting the right foods and planning meals for hypertensive patients. A sample menu (providing 1700-1800Kcal) for a hypertensive patient is presented at Table 8.5 for your reference.

Table 8.5: A sample menu (providing 1700-1800 Kcal) for hypertension patient

Early Morning	Breakfast	Mid-Morning	Lunch	Tea/Evening snack	Dinner	Bed Time
1 Cup Tea / Coffee (prepared with skim milk & 1 tsp sugar only) OR Lime Juice (in water with honey)/ Coconut Water + Biscuits (2)	Toned Milk (1 glass) Poha/Upma/Corn flakes/Daliya/ (1Katori) OR Bread (2) with Egg (1) jam or white Butter 5gm) OR Ragi idli (2 piece) OR Chapati – 1 with vegetable, Fruit-1	Soup (dudi / mix veg / tomato) OR Coconut Water/ Lime Juice, OR Fruit Chaat (1 bowl)	Chapati – 1, Rice – 1 Katori, Dal – 1 Katori OR 1 Medium size piece of Chicken or Fish in gravy Veg – 1 Katori (Dark green leafy veg & Yellow-orange veg), Curd – 1 Katori 1 Bowl raw veg Salad with sprouts	1 Cup Tea / Coffee (prepared with skim milk & 1 tsp sugar only) OR Lime Juice (1 glass), High fibre Biscuits (2) OR Roasted Chana/ Sprouts Salad	Chapati – 1, Rice – 1 Katori, Dal – 1 Katori OR (Paneer – 50 gms/ meat/chicken gravy dish) Veg – 1 Katori, Curd – 1 Katori 1 Bowl raw veg Salad with sprouts	Milk – 1 Cup (no sugar)

Use minimum salt in cooking. Avoid table salt

You may have noticed that the meals of a person with high blood pressure need not be very different from meals provided to a normal person but success lies in lowering salt intake and eating whole foods that are high in nutrients. As per the salt restriction prescribed, {mild

sodium restriction: 2-3 g OR Moderate sodium restriction: 1g OR Strict sodium restriction: 0.5 g} diet may be planned by judicious selection of foods.

Some handy lifestyle modifications and proven interventions for prevention and treatment of hypertension are summarized herewith for your reference.

Lifestyle Modifications and Interventions for Prevention and Treatment of Hypertension

Lifestyle Modifications	Recommendation/Intervention
Weight Loss	Best goal is to maintain ideal body weight. BMI (Weight (kg)/Height (m) ^{2}) < 22.9 kg/ m^2 (Asian population). Waist circumference should also be maintained at an appropriate level (< 90cm for men and < 80 cm for women). Aim for at least 1-kg reduction in body weight for most adults who are overweight. 1kg reduction in body weight will reduce blood pressure by 1mm/Hg
Healthy Diet	• Adapt the ***DASH*** (Dietary Approaches to Stopping Hypertension) dietary pattern. The DASH diet consists mainly of fruits, vegetables and low-fat dairy products and includes whole grains, poultry, fish and nuts while limiting the amount of red meat, sweets and sugar-containing beverages. • Provide a rich-fibre diet such as: - Whole grain cereals (wheat, maize, dalia, oats etc.) and cereal products (whole wheat bread, multigrain bread etc.). Do not sieve wheat flour. Add bran to wheat flour, if needed, - Whole pulses such as chana, lobia, rajmah etc., include sprouted pulses in the diet as salads, or as a filling, - Plenty of vegetables in the diet, particularly fresh green vegetables as salads in both meals, - Whole fruits (4-5 servings), preferably with edible peel. • Use healthy oils such as soyabean oil, rapeseed oil, mustard oil. • Include low-fat dairy and dairy product • Intake of fish and poultry to be encouraged
Reduced intake of dietary sodium	• Select foods that are low in sodium. Refer to Table 8.4(a) for Judicious selection of foods low in sodium. • Watch out for processed food, packaged foods and restaurant food, especially fast food, which tend to be high in salt. • Lower the salt intake. The target of salt restriction is <3 g/day. • NO ADDED SALT. Avoid use of table salt. Use lemon, vinegar, tamarind etc. for flavoring salads.
Enhanced intake of dietary potassium	• Enhance the intake of dietary potassium.Include foods rich in potassium (refer to Table 8.4(b) like fruits, vegetables etc.
Physical Activity	Encourage physical activity such as brisk walking for at least 30-45 minutes every day or any other moderate intensity exercise such as active yoga, swimming, biking, aerobic exercises etc.

Quit Smoking Moderation in Alcohol Intake	No smoking In individuals who drink alcohol, reduce alcohol to: Men: ≤2 drinks daily, Women: ≤1 drink daily.

Some do's and don'ts related to management of hypertension are highlighted herewith. Remember hypertension can go undetected and can slowly over a long period of time damage the body before symptoms develops. So prevention and management will go a long way in maintain good health.

Do's	**Don'ts**
- Encourage the patient not to skip meals. Take meals at regular intervals. - Increase the intake of foods rich in dietary fibre and complex carbohydrates such as. whole grain cereals, ragi, legumes, sproted grams, fruits and vegetables - Include plenty of fresh fruits and vegetables in the diet instead of processed foods - Include low calories snacks in the diet - Include toned or skimmed milk and its products in the diet - Egg white, lean meat, chicken, fish may be included in limited amounts - Advice the individual to read nutrition labels. Look for foods labeled 'Low Sodium' or 'No Salt Added'. - Encourage the patient to quit smoking, if patient is a smoker - Encourage the individual to quit alcohol or limit alcohol intake	- Avoid high fat, sugar, salt foods and other junk foods - Avoid table salt - Avoid salted butter, processed cheese, fried and salted snacks such as poories, kachori, pakora, samosa, chips, popcorn, salted nuts, biscuits etc. - Limit canned or ready-to-eat foods such as namkeen, soups, preserved foods such as pappad, pickles, sauces, chutneys etc. as they are rich in fat, salt and preservatives. - Avoid gravies made with saturated fats such as butter, ghee, dalda, margarine etc. - Avoid ajinomoto (monosodium glutamate), mayonnaise/salad dressings, baking powder, soda/diet coke etc. - Avoid refined cereals like maida, suji etc. - Avoid whole/full cream milk and its products