CBSE Study Material for Students

FOOD NUTRITION AND DIETETICS

Class XII

Prepared by -

Prof. Deeksha Kapur, Discipline of Nutritional Sciences, SOCE, IGNOU, New Delhi
Mrs Anita Khosla , Principal,G D Goenka Public School ,New Delhi
Mrs Deepti Sharma , PGT Biology G D Goenka Public School ,New Delhi

Unit 1

Chapter 1: THERAPEUTIC NUTRITION

***Learning Objectives*:**

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

1. Define the terms dietetics, clinical nutrition & therapeutic diet,
2. Enumerate the scope of dietetics and the role of dietitian in health care,

Welcome to the study of clinical and therapeutic nutrition. Clinical nutrition, 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. 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. So let us get to know more 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. 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.

Role of Dietitian in Nutrition Care

Dietitian you know is an expert in dietetics, dealing with human nutritional care. A dietitian applies 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 l 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

CHAPTER 2: THERAPEUTIC DIETS

***Learning Objectives*:**

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

1. Enumerate the scope of dietetics and the role of dietitian in health care,
2. Explain the diets of altered consistencies,
3. Discuss the adaptation of normal diet to therapeutic diets, and

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

Refer to Figure 1.1 which illustrates routine hospital diets.

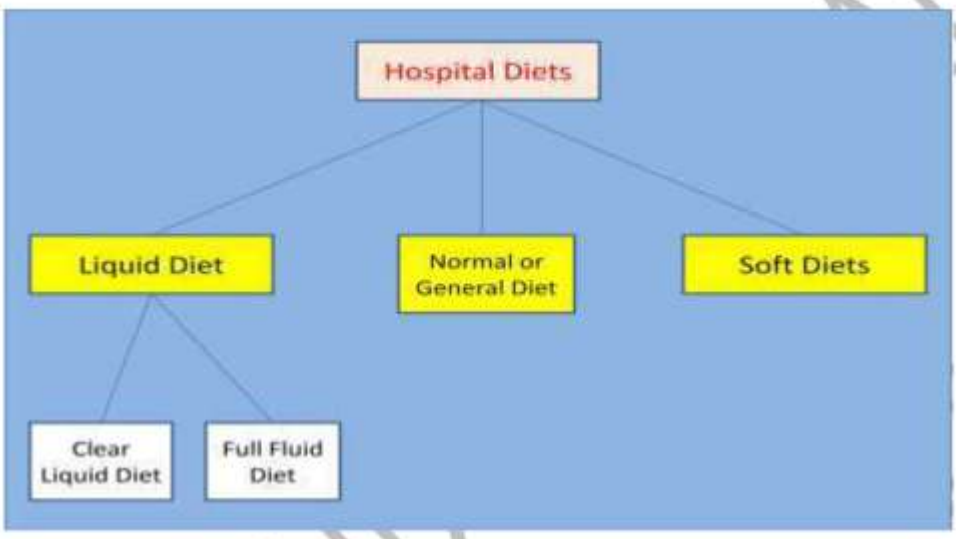

Figure 1.1: Routine hospital diets

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(Indian council for Medical Research) 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 lifesaving 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

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 steatorrhea 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.

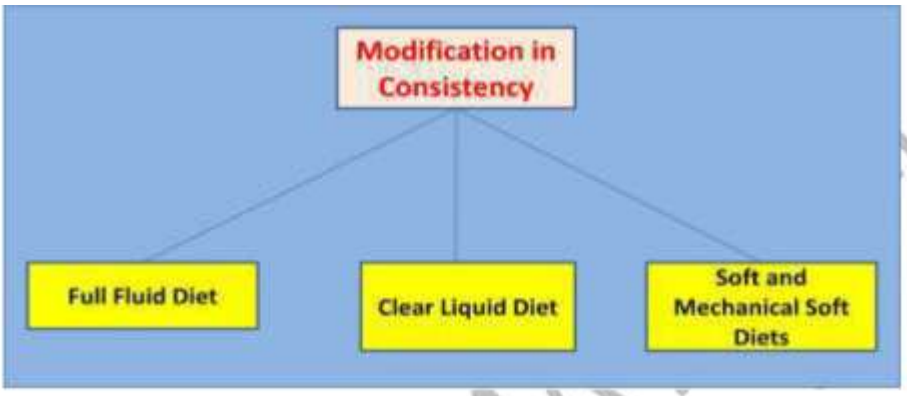

Figure 1.2: Modifications in consistency

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.

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. 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, yogurt, 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 flavors. 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.

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, gastritis 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 flavored 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 anemia) 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 maintains 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, blending 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.

Chapter 3: NUTRITION AND INFECTION

***Learning Objectives*:**

After reading this chapter, 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 chapter.

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.

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, behavior 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 2.1 illustrates this interaction.

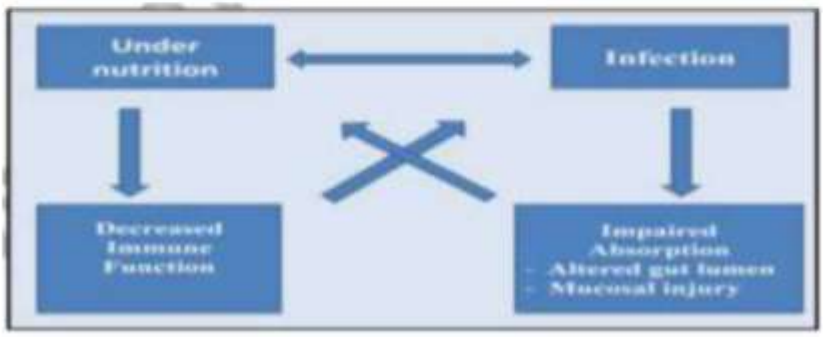

Figure 3.1: Interaction between infection and malnutrition

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 3.1. 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 3.2.

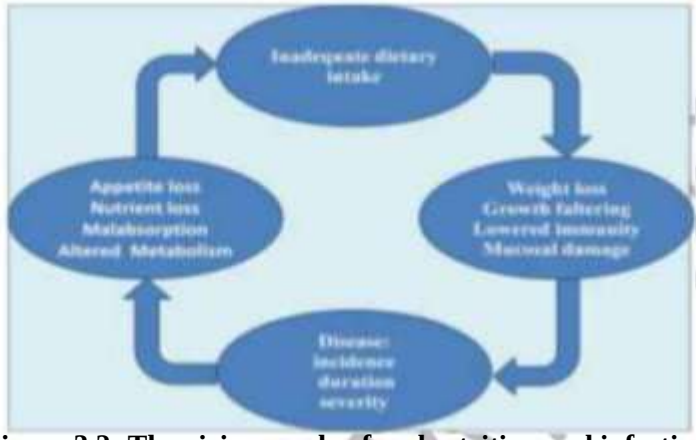

Figure 3.2: The vicious cycle of malnutrition and infection

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 breastmilk) 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.

Effect of Malnutrition on Infection

With reference to Figure 3.1 and 3.2, 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 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.

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, mucosal 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.

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 is 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.

CHAPTER 4: METHODS OF COOKING

***Learning Objectives*:**
After reading this chapter, the students will be able to:

1. Describe different methods of cooking ,
2. Explain and ensure the nutritive values in various methods of cooking.

Many foods are consumed as such in the raw state while some are cooked to make them edible. Food is being cooked as it tastes better Even vegetable and fruits are cooked to add variety to the diet and make them easily palatable, attractive and colorful. Cooking also kills many microorganism and makes the food safe to be consumed. Several raw foods have anti-nutritional factors which are destroyed by cooking. It also enhance the availability of some nutrients.

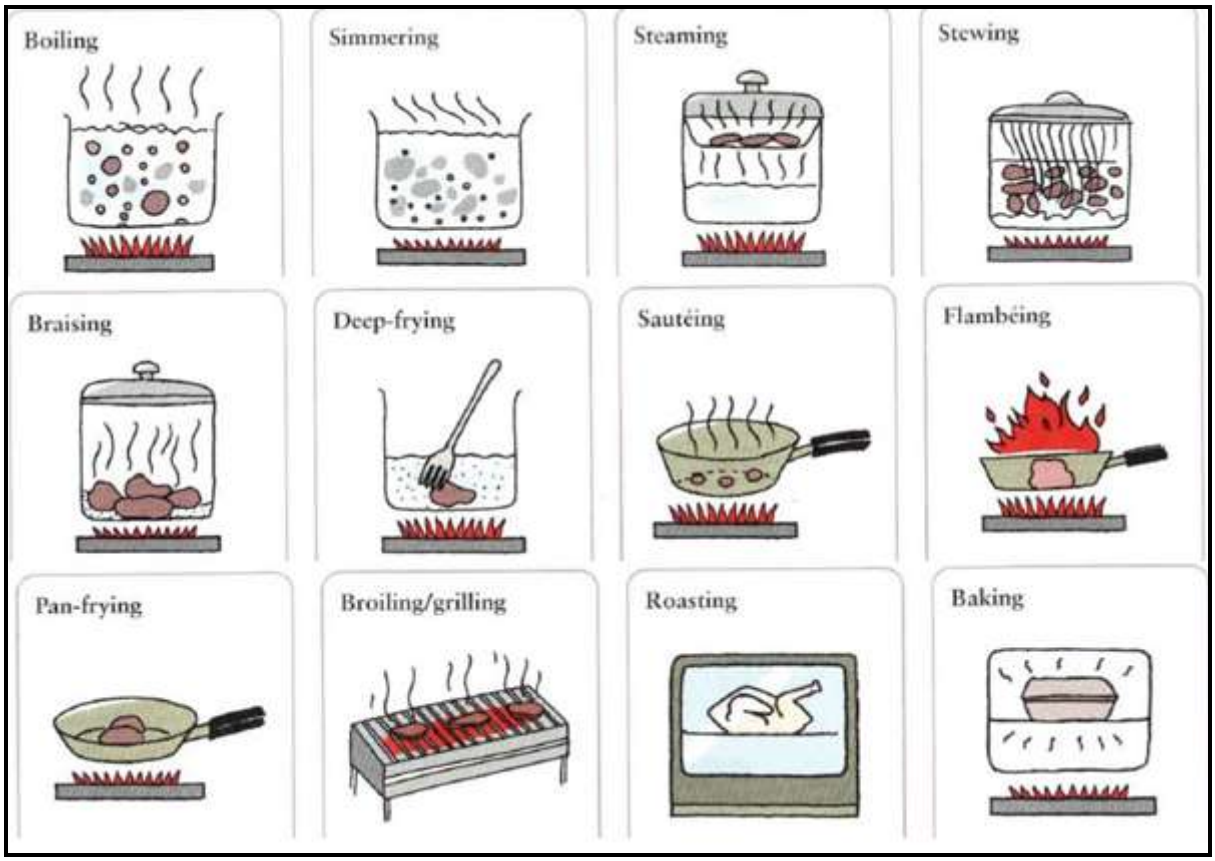

Figure 4.1 Different methods of cooking

Principles of cooking food

1. Foods must be cooked in a way that it retains the original flavours.
2. Sometimes the flavor of the food is drawn out into the gravy or broth.
3. The preservation of the maximum nutritive value can be ensured by using the correct method of cooking.

Cooking methods

During cooking, heat may be transferred to the food by conduction, convection, radiation or by the energy of microwave-electronic heat transfer.

Table 4.1: Classification of Cooking Methods

Moist Method	Dry heat	Combination Method
Boiling	Roasting	Braising
Simmering	Griling/ Broiling	
Poaching	Toasting	
Stewing	Baking	
Blenching	Suffering	
Steaming	Frying	
Pressure Cooking		

i) **Moist Methods:** These are the methods in which we use the heat generated by water in some form or the other. Some of the important ones are explained as follows:

a) Boiling

Foods are cooked by placing them in boiling water at 100^0 C and maintain this temperature till the desired stage of cooking has been reached. Rice, pulses, potatoes are cooked this way.

Advantages

1. Simplest Method of cookery
2. Boiling of food brings about uniform cooking of food
3. At high temperatures protein content of food get denatured and embedded in food
4. Starch gets gelatinized and collagen gets hydrolyzed.

5. Boiling of foods aids in proper digestion

Disadvantages

1. The process of boiling takes time.
2. When excess of water is used the water soluble nutrients are lost.
3. Loss of minerals is also a big disadvantage with boiling.
4. Boiling of food brings about its decoloration

b) Pressure Cooking

In this method the food is cooked under pressure and with increase in pressure the temperature also correspondingly increases. Thus the food is cooked very fast. Actually it is a type of steaming only, in which water is boiled under high pressure, thus raising the temperature and reducing the cooking time.

Advantages

1. Reduces cooking time.
2. Fuel efficiency increased.
3. Nutrient loss is less.
4. Food is cooked properly and is made tender.
5. The flavor and aroma of the food is trapped inside the cooker and is not lost.

Disadvantages

1. Long hours of pressure cooking make food soggy and too soft.
2. Flavors of foods may make and individuality be lost.

c) Steaming

This method uses steam as the medium of cooking. The food is surrounded by steam and is cooked by the heat supplied from steam. Types of steaming are:

- Dry steaming: The steam generated from double boiler is used for cooking food. Sauces and custards are made by this method.

- Wet Steaming: Steam comes in direct contact with the food and cooks it. Dhokla and idli are made by this method.

Advantages

1. Constant stirring is not required.
2. Nutritive value of food remains intact.
3. Cooking time is less.
4. No external is added which makes the food easily digestible.
5. The flavor of the steamed food is good.

Disadvantages

1. Dhokla cooker and Idli makers are required.
2. Special vessels are essential for steaming food.
3. Limitation of the type of foods that can be cooked by this method.

d) Poaching

This method is generally used for eggs. This involves cooking in the minimum amount of liquid at a temperature of 80-85℃. Fish and fruits are also poached.

Advantages

1. Cooks food quickly.
2. There is no addition of fat.
3. The foods that are poached are better digestible.

Disadvantages

1. Water soluble nutrients leach into the water.
2. The foods are generally bland in taste.

e) Toasting

Generally applied for bread slices which are browned from both sides by keeping them between two grilles.

Advantages

1. Improves color, flavor and texture of food.
2. Roasted seeds are easy to grind.
3. Roasting reduces the amount of moisture of foods

Disadvantages

1. A continuous vigil is required to prevent burning.
2. Amino acids are lost while toasting.

f) Baking

The medium of cooking is hot air. A dry method of cooking, it combines steam which is generated while food is cooked. Cakes, custard, baked vegetables, bread, biscuit, pizzas are all baked food.

Advantages

1. Texture and flavor of foods are improved.
2. Baking give rise to a variety of combination of dishes.
3. Foods are cooked uniformly in an oven.

Disadvantages

1. An oven is required for baking.
2. Over cooking results in the burning and scorching of food.

g) Blanching

Blanching is a cooking process wherein a food, usually a vegetable or fruit, is scalded in boiling water or oil, removed after a brief, timed interval, and finally plunged into iced water or placed under cold running water (shocking or refreshing) to halt the cooking process.

Advantages

1. Blanched dishes are healthy as there is minimal loss of nutrients because of the short cooking time.
2. Blanching also enhances the color of green vegetables, and the time taken is also lesser than other moist heat cooking methods.

Disadvantages

1. Blanching cannot be used for every type of food item.
2. Blanching often needs to be coupled with another cooking process so as to provide more flavor to the final dish.

UNIT 2: DIET IN HEALTH AND DISEASE

(CAUSES, PHYSIOLOGICAL CONDITIONS, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

CHAPTER -5: FEVERS (ACUTE&CHRONIC)

(TYPES, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**
After reading this chapter, 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 & 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: CLASSIFICATION AND TYPES

Fevers are primarily classified into three categories: Acute, Sub-acute and Chronic fevers based on duration as highlighted in Figure 5.1.

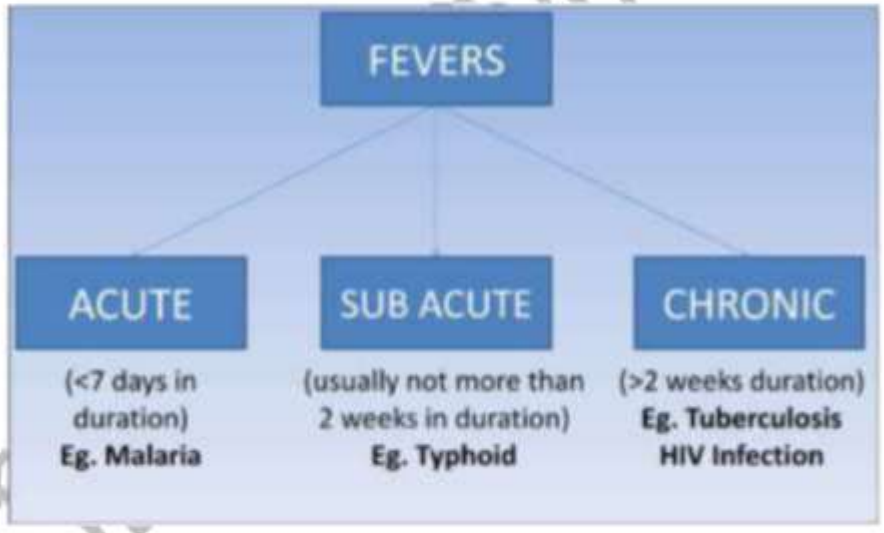

Figure 5.1 Classification of fevers

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 week in duration

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 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°C rise in body temperature.(or 7% increase with every 1°C 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.

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 in sub-acute fever, followed by dietary therapy for chronic fever.

DIETARY MANAGEMENT OF SUB-ACUTE FEVER

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.

Dietary management in Sub-acute fever

The main objective of dietary management during sub acute fever 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 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 5.1.

Table 5.1: Dietary considerations and nutritional needs during sub-acute fever.

1600 Kcal Diet Chart

Meal	**Menu**	**Amount**
Early Morning	Coconut water **(Liquid and electrolytes)** Glucose biscuit	1 glass (250ml) 2 No.
Breakfast	Potato sandwich with butter (high calorie) Banana Apple Juice	1 portion (2 slices) 1 No. (100-150gms) 1 glass (250ml)
10.00am	Buttermilk **(salty)** Suji upma	1 glass (250ml) 1 katorie cooked
Mid Morning (12:00noon)	Clear dal soup	1 big bowl (200ml)
Lunch	Khichri Soft Vegetable (Lauki/ Tinda/ Pumpkin/potato) Washed dal Curd Cooking oil	1 big bowl 1 katorie cooked 1 katorie cooked 1 katorie 1 - 1½ tsp
Evening tea	Tea with sugar Glucose Biscuit	1 cup with 2 tsp 2 No.
Evening Snack	Lemon Water (sugar and salt) Stewed apple	1 glass 1 katorie cooked
Dinner	Boiled Rice Soft Vegetable (Lauki/ Tinda/ pumpkin/ potato) Washed dal Curd Cooking Oil	1 big bowl 1 katorie cooked 1 katorie cooked 1 katorie 1 1 ½ tsp
Bed time	Apple Juice	1 glass (250 ml)

Following the dietary considerations highlighted in Table 5.1, we hope you should be in a position to plan a diet for a typhoid patient.

. Do's and Don'ts, and a list of what foods to give and what foods to avoid are highlighted herewith. You may consult the list while planning the diet.

Table 5.2: 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 5.2, some do's and don'ts basic tips are presented in

Table 5.3: Do's and Don'ts

Do's	Don'ts
1. Always wash vegetables, 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 day in the form of water, fruit juices, tender coconut water and soup 5. Eat small frequent meals 6. Make sure the food is thoroughly cooked and served steaming hot	1. Avoid places that do not maintain hygiene, avoid foods from street vendors 2. Don't buy open and cut fruits and vegetable 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 fats in cooking 6. Avoid eating food at room temperature 7. Avoid unpasteurised dairy products 8. Avoid using ice made from tap or well water 9. Avoid close contact or sharing eating utensils, cups with people who are infected

DIETARY MANAGEMENT OF CHRONIC FEVER

Tuberculosis (TB), you may be aware, is an example of chronic fever 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 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, under nutrition 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. Tuberculosis is completely curable through short-course chemotherapy. Treating TB cases who are sputum-smear positive (and who can therefore spread the disease to others) at the source, it is the most effective means of eliminating TB from a population.DOTS or Directly Observed Treatment Short course is the internationally recommended strategy for TB control that has been recognized as a highly efficient and cost-effective strategy.

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.

Dietary considerations for tuberculosis

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 include liberally or restrict/avoid in the diet of a TB patient.

Table 5.4: Foods to include and to be restricted/ avoided in the diet of tuberculosis patient

Foods to include	Foods to avoid
1. Cereals and millets (wheat, rice, ragi, jowar) 2. Pulses (rajma, black chana, soyabean) 3. High energy, protein drinks and beverages 4. Foods providing proteins of high biologic values ex.- eggs, soft cheese, tender meat, fish etc. 5. Cereals pulse combination with some animal protein ex. Khichri with curd etc. 6. Nuts and oil seeds like pea nuts 7. Seasonal fruits and vegetables 8. Green leafy vegetables like maithi, mint, spinach, cabbage etc. 9. Citrus fruits 10. Milk and milk products 11. Vegetables oils and dairy fat like ghee 12. Jaggary and sugar	1. Red meat and organ meats 2. Limit refined foods 3. Strongly flavored vegetables 4. Excess fat 5. Fried fatty food 6. Sweets concentrated food 7. Acidic and spicy food such as pickles 8. Spices, condiments and seasoning

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

Table 5.5: Do’s and Don’ts

Do’s	Don’ts
1. Always washed vegetables and fruits with clean water before serving 2. Wash hands frequently particularly before eating or preparing food 3. Give plenty of fluids and electrolytes to compensate for loses 4. Provide 6 frequent meal per day 5. Include 5-6 portion of fruits and vegetable in the diet each day 6. Include meals which are easy to digest well tolerated 7. provide a good multivitamin and mineral supplements	1. Do not serve large meals to prevent discomfort 2. Do not excessive fat in cooking 3. Consumption of tobacco and alcohol should be avoided 4. Caffeine tea consumption should be avoided 5. Avoid close contact or sharing utensils, cups with people who are infected

CHAPTER 6: DIARRHOEA
(TYPES, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

Learning Objectives:
After reading this chapter, 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. This chapter will focus on the classification/terminologies, determinants, preventive and control strategies of diarrhoea and dietary principles for management of diarrhoea at home or in a community setting.

DIARRHOEA: DEFINITION, CAUSES & SYMPTOMS

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.

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.

Figure 6.1: Types of diarrhoea

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.

SYMPTOMS OF DIARRHOEA

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 diarrhea 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.*

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.

Causes of diarrhea

- Diarrhoea, 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
- Parasites, 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

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.

The major objectives in the management of diarrhoea include:

1. Fluid and electrolyte replacement
2. Removal of cause (especially if infection)
3. Nutrition concerns
4. Determining the status of dehydration
5. Fluid management(ORT-Oral rehydration therapy)
6. Nutritional management

The first step in diarrhea management is to determine the status of dehydration. Let us consider this

Determining the status of Dehydration

Table 6.1: 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

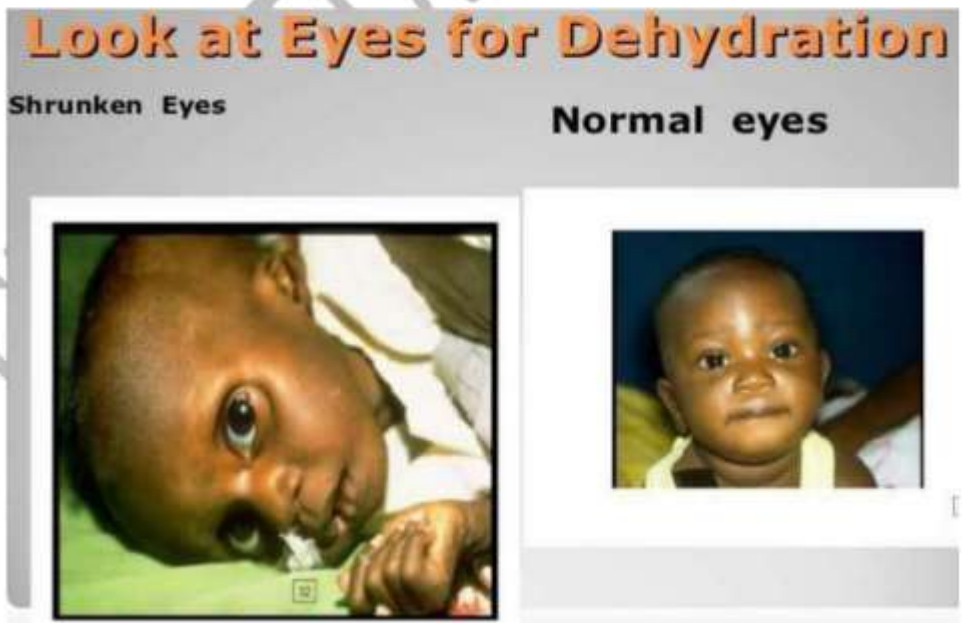

Figure 6.2a: Sunken eyes - a sign of dehydration

Figure 6.2b: Skin pinch - goes back slowly

A review on the use of ORT and the fluid therapy in the management of dehydration is presented next. 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.

. 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 6.2 for easy reference.

Table 6.2: 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 6.3.

Table 6.3: Other oral rehydration therapies*

	Composition per litre	**Appropriate use**
Home made fluids Sugar and salt solution	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

CHAPTER 7-EATING DISORDERS

(DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS,CLINICALSYMPTOMSAND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this chapter, 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.

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 chapter 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.

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 iii) the eating is accompanied by a subjective sense of loss of control.

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.

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.

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 - 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),	- 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 they are not needed - Dehydration, Electrolyte imbalance which can lead to kidney and heart failure	- 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

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 chapter. 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.

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.). Though 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

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 preview.

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.

An illustrative 3000Kcal diet plan/menu is presented in Table 7.2 for reference.

Table 7.2: 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.

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.

CHAPTER: 8 OVER WEIGHT/ OBESITY

(DEFINITION, CAUSES, CLINICAL SYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**
After reading this chapter, 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.

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:

$$IBW = (\text{height in cm} - 100) \times 0.9$$

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/m2).

$$[BMI = \text{Weight (kg)}/\text{Height (m) } 2]$$

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 8.1. 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 .1.

Table 8.1: 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 8.1 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: $70/1.6 \times 1.6 = 27.34 kg/m^2$. As per BMI classification (Asian population in Table 8.1), 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 8.1 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.

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.

Figure 8.1 Fat **around abdomen**

Table 8.2: 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 8.2.

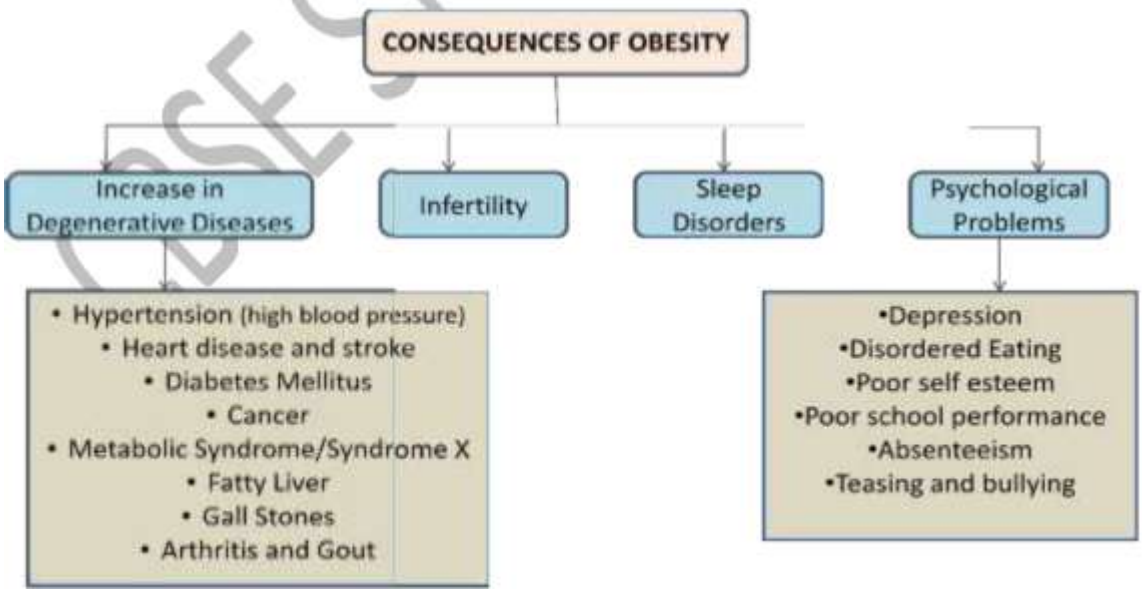

Figure 8.2: Major health consequences of overweight and obesity

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?

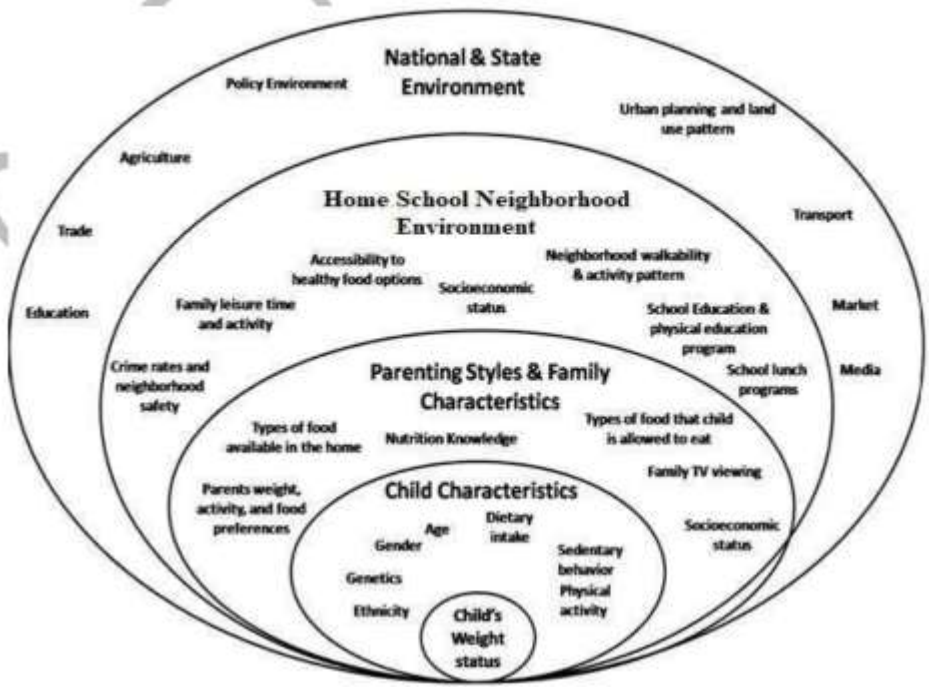

Figure 8.3: The causes and risk factors of obesity

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 8.3 lists the key factors that might promote weight gain and obesity.

Table 8.3: 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 8.3, 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 8.4.

Table 8.4: Dietary considerations and nutritional needs for overweight and obesity

Dietary requirements	Recommendation	Dietary Considerations
Energy (Kcal) *For adults* *For older children and adolescent*	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 Adult guidelines may be adopted	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.
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	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

	(makes the individual feel full).	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) - 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	- Consume 5-6 servings of fruits and vegetables daily. - 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 8.4, we hope you should be in a position to counsel and plan a diet for an overweight or an obese individual. A sample low calorie diet based on the amounts recommended is also presented in table 8.5 & 8.6

Table 8.5: 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
Evening0 (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)

Table 8.6: 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/Brown 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

Unit 3: Diet in Health and Disease: II

Chapter 9: Hypertension

Chapter 10: Diabetes

Chapter 11: Jaundice/ Hepatitis

Chapter 12: Celiac disease, Lactose Intolerance, Peptic ulcer

CHAPTER 9: HYPERTENSION

(DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, COMPLICATIONS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

After reading this chapter, 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. 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.

Hypertension is a health condition characterized by high blood pressure. Blood pressure (BP) 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. An instrument/devise called sphygmomanometer is used to measure BP.

An optimum blood pressure level is a reading under 120/80mm Hg. The numerator 120 represents the pressure when the heart contracts and is referred to as "Systolic pressure". The systolic measurement is the peak pressure in the arteries. The denominator 80 represents the pressure when the heart relaxes (is at rest) between beats, called the "Diastolic pressure". 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 9.1

Table 9.1: 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

SYMPTOMS AND PHYSIOLOGICAL CONDITIONS

I. Consequences of hypertension:

(a) 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, the fat from the diet enters the blood stream and tends to get collect in the inner walls of arteries, over a period of time it leads to the narrowing of the lumen of the arteries, as a result artery walls becoming less elastic, limiting blood flow through the body. The diseases of the arteries resulting from the blockage of arteries are generally called coronary artery disease (CAD).

Figure 9.1 Blood Vessel

(b) Damage to heart: The major function of the heart is to pump blood to the entire body. Uncontrolled blood pressure can damage the heart in several ways. 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 heartbeat 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, fatigue.

(c) 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.

(d) 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.

(e) Damage to 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.

(f) Sleep Disorder: 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.

II. Causes of Hypertension

The factors that play a role in causing or increasing the risk of getting a disease are called risk factors. Table 9.2 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 9.2 you will notice that these factors are categorized as *modifiable* and *non-modifiable*.

Table 9.2: Risk Factors Common in Patients with Hypertension

Modifiable Risk Factors	Relatively Fixed/Non-modifiable Risk Factors
- Cigarette smoking, secondhand smoking - Diabetes mellitus - Dyslipidemia/hypercholesterolemia - Overweight/obesity - Physical inactivity/low fitness - Unhealthy diet	- CAD - Family history - Increased age - Low socioeconomic/educational status - 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 systolic pressure with age. Excessive sodium intake can cause body to retain fluid and also cause arteries/blood vessels to constrict, which increases blood pressure. Also a diet high in calories, saturated fats like ghee, butter and food rich in animal fats (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.

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.

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.

MANAGEMENT OF HYPERTENSION & DIETETICS

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

I. 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

Table 9.3 (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, Horlicks, 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 9.3 (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 9.3 and the sodium/potassium content of some common foods 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 9.4 for your reference.

Table 9.4: A sample menu (providing 1700-1800 Kcal) for hypertension patient

Early Morning	Breakfast	Mid-Morning	Lunch	Tea/Evening snack	Dinner	Bedtime
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/Dalia/ (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 fiber 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.

Table 9.5 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-fiber 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 soybean 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. - 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 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 Limit the intake of Alcohol	- No smoking - Moderate amount of alcohol should be taken.

Table No.9.6 Some Do's and Don'ts related to management of hypertension are highlighted herewith.

Do's	Don'ts
- Encourage the patient not to skip meals. Take meals at regular intervals. - Increase the intake of foods rich in dietary fiber and complex carbohydrates such as. whole grain cereals, ragi, legumes, sprouted 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

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CHAPTER 10: DIABETES MELLITUS

(DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, COMPLICATIONS AND DIETARY MANAGEMENT)

Learning Objectives:

After reading this , 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 focus on diet therapy and dietary management.

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 In this chapter 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.

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. Insulin, 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 to produce 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.

SYMPTOMS & PHYSIOLOGICAL CONDITIONS

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 hyperglycaemia 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.

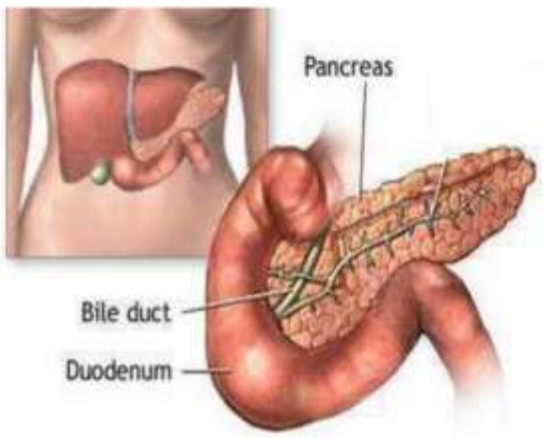


Figure 10.1 Pancreas

The criterion for the diagnosis of diabetes is given in Table 10.1.

Table 10.1: Criterion for the diagnosis of diabetes

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

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

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

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 Hemoglobin** (HBA1c). When the concentration of glucose in blood rises, more of it gets attached to hemoglobin (which is a pigment present in red blood cells that carries oxygen to the cells of the body) forming **glycosylated hemoglobin** (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 hemoglobin 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.

I. 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 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 below.

Figure 10.2 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 fiber 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 fiber (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.

Complications of Diabetes

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 (**Polydipsia)** 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.

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, sometime low) in the blood glucose levels.

MANAGEMENT OF DIABETES & DIETETICS

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

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

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. Before you review these considerations, it is important for you to understand that carbohydrates and dietary fiber 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.

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 10.2

Table 10.2: 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
Chapati	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 Boiled)	39 ± 4
Millet porridge	67 ± 5	**Dairy Products**	
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	Chickpeas	28 ± 9
Popcorn	65 ± 5	Soya Beans	16 ± 1
Soft drinks/soda	59 ± 3	Lentils	32 ± 5
Honey	61 ± 3		
Glucose	103±3		

Table 10.3: 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
- Green leafy vegetables like spinach, drumstick, fenugreek, mustard, amaranth, cabbage etc. - Vegetables like cauliflower, brinjal, lady finger Bhindi), bottle gourd (ghia), Bitter gourd (karela) etc., - High-fiber foods (raw fruits with hard skin or seeds, green leafy vegetables, other vegetables etc.) - Condiments and Spices (fenugreek seeds, pepper dry, cumin, cloves cinnamon, turmeric, poppy seeds etc.)	- Whole grain cereals, millets and their products e.g. whole wheat flour, whole wheat bread, oats, bajra, jowar roti etc. - Whole pulses, lentils with husk, chick peas, pigean pea, beans, peas etc. - Raw fruits with hard skin or seeds such as apple, pear, guava, apricots, berries, pomegranate, etc. - Fruits like banana, mangoes, dates, grapes, custard apple, chikoo (sapota), oranges *should be taken with caution*. - Nuts and Oilseeds - Milk and dairy products (low fat). - Meat and meat products, preferably fish, chicken, egg white. - Artificial sweeteners.	- Refined cereals and their products (e.g. Maida, suji, white bread, white rice, pasta etc.) - Plain gelatin-based desserts, sugars, sweets, honey, candy, jam and jellies. - Sweet concentrated foods using excessive whole milk and dairy fat including halwas, ladoos etc. - Cakes and pastries. - Sweetened juices and soft drinks - Processed foods with high fructose corn syrup. - Red meat and organ meat (liver, brain etc.) - Roots and tubers like potato, yam, sweet potato, beetroot, tapioca, colocasia (arbi) not recommended - Fried fatty foods such as samosas, pakoras, puri, paratha cooked in Vanaspati.

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
- Appropriate self-care skills
- Appropriate resources
- Positive attitude

In addition to the list provided in Table 10.3, some do's and don'ts and basic tips are presented in Table 10.4 Make a note of these.

Table 10.4: Do's and Don'ts

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

CHAPTER 11: HEPATITIS/ JAUNDICE

(DEFINITION, CAUSES, PHYSIOLOGICAL CONDITIONS, COMPLICATIONS AND DIETARY MANAGEMENT)

Learning Objectives:

After reading this chapter the students will be able to:

1. Understand the role of Liver in the smooth functioning of the body.
2. Enumerate the risk factors in causation of Jaundice and Hepatitis,
3. Discuss the complications and consequences of Jaundice and Hepatitis.
4. Describe the dietary management and prevention of Liver infected diseases.

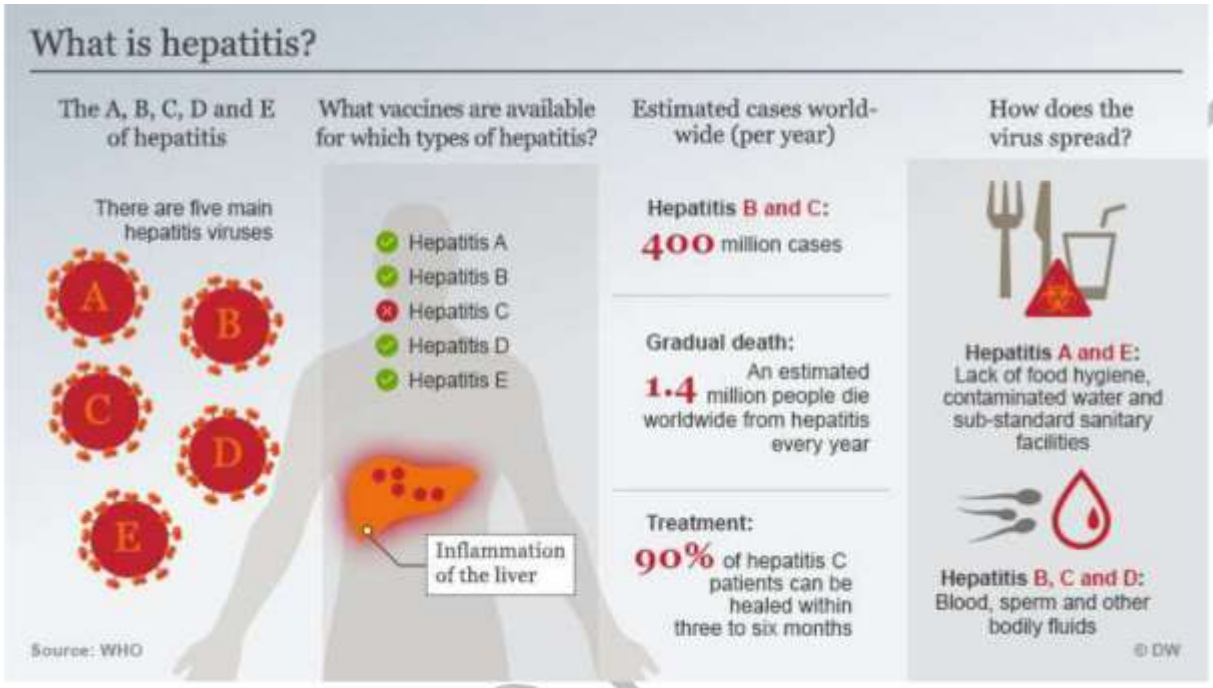
Liver is the largest organ of the body constituting 2.5 to 3% of the body weight. It is a multifunctional organ which plays an important role in carbohydrate, fat and protein metabolism. Most of the end products of digestion of food are transported directly to the liver. Compounds which it synthesizes, or stores are sent to other parts of the body when needed. Toxic substances which may enter via food or are produced in other parts of the body are detoxified here. Thus, liver has an important bearing on the nutritional status and diseases of this organ markedly affect health.

The function of the liver has been summarised in the table given below: -

Protein Metabolism	- Synthesis of plasma proteins, carrier proteins like transferrin and coagulation factors
Carbohydrate Metabolism	- Synthesis, storage and release of glycogen. Synthesis of heparin, Gluconeogenesis from amino acids, conversion of glucose into fatty acids, interconversion of monosaccharides
Lipid Metabolism	- Synthesis of lipoproteins, phospholipids and cholesterol, conversion of fatty acids, carbohydrates and protein intermediates to fat, formation of file, conjugation of bile salts.
Mineral and Vitamin Metabolism	- Storage of iron, copper etc., large reservoir of vitamin A and Vitamin D, Conversion of blood coagulation factors to prothrombin in the presence of vitamin K, conversion of β-carotene to retinol and Vitamin D to its active metabolites.
Immunological	- Important part of lymphoreticular system
Detoxification	- Of bacterial decomposition products, mineral poisons, alcohol and certain drugs like morphine and dyes.

HEPATITIS

Hepatitis is an inflammation of the liver. The condition can be self-limiting or can progress to fibrosis (scarring), cirrhosis or liver cancer. Hepatitis viruses are the most common cause of hepatitis in the world but other infections, toxic substances (e.g. alcohol, certain drugs), and autoimmune diseases can also cause hepatitis.



SYMPTOMS & PHYSIOLOGICAL CONDITIONS

I. Causes:

There are 5 main hepatitis viruses, referred to as types A, B, C, D and E.

Hepatitis A virus (HAV) is present in the faeces of infected persons and is most often transmitted through consumption of contaminated water or food. Certain sex practices can also spread HAV. Safe and effective vaccines are available to prevent HAV.

Hepatitis B virus (HBV) is transmitted through exposure to infective blood, semen, and other body fluids. HBV can be transmitted from infected mothers to infants at the time of birth or from family member to infant in early childhood. Transmission may also occur through transfusions of HBV-contaminated blood and blood products, contaminated injections during medical procedures, and through injection drug use. Safe and effective vaccines are available to prevent HBV.

Hepatitis C virus (HCV) is mostly transmitted through exposure to infective blood. This may happen through transfusions of HCV-contaminated blood and blood products, contaminated injections during medical procedures, and through injection drug use. Sexual transmission is also possible, but is much less common. There is no vaccine for HCV.

Hepatitis D virus (HDV) infections occur only in those who are infected with HBV. The dual infection of HDV and HBV can result in a more serious disease and worse outcome. Hepatitis B vaccines provide protection from HDV infection.

Hepatitis E virus (HEV) is mostly transmitted through consumption of contaminated water or food. HEV is a common cause of hepatitis outbreaks in developing parts of the world and is increasingly recognized as an important cause of disease in developed countries. Safe and effective vaccines to prevent HEV infection have been developed but are not widely available.

Initial symptoms of hepatitis caused by infection are like the flu and include:

- Muscle and joint pain
- A high temperature (fever) of 38°C (100.4F) or above
- Feeling unwell
- Headache
- Occasionally yellowing of the eyes and skin (jaundice), Symptoms of chronic hepatitis can include: Feeling tired all the time, Depression, Jaundice, A general sense of feeling unwell.

The period of time between exposure to hepatitis and the onset of the illness is called the incubation period. The incubation period varies depending on the specific hepatitis virus. Hepatitis A virus has an incubation period of about 15 to 45 days; Hepatitis B virus from 45 to 160 days, and Hepatitis C virus from about 2 weeks to 6 months. Many patients infected with HAV, HBV, and HCV have few or no symptoms of illness.

The most common symptoms of different types of hepatitis includes:

- Dark urine (hepatitis A, B, C)
- Stomach pain (hepatitis B, C)
- Yellow skin or eye whites, called jaundice (hepatitis A, B, C)
- Pale or clay-coloured stool (hepatitis A, C)
- Low-grade fever (hepatitis A, B, C)
- Loss of appetite (hepatitis A, B, C)
- Fatigue (hepatitis A, B, C)
- Feeling sick to your stomach (hepatitis A, B, C)
- Aching joints (hepatitis B)

II. Preventions

Prevention and control measures which can be adopted are listed below:-

- Control of reservoir: - It is very difficult to achieve this because of poor sanitary facilities of the community and no specific treatment available to kill the organism.

- Control of transmission: - Spread of the infection can be controlled by strict personal hygiene, e.g. thorough hand washing with soap before eating and after going to the toilet; sanitary disposal of sewage to prevent contamination of drinking water and eatable.

- Control of susceptible population: - Susceptible population groups may seek medical advice for suitable control measures. Certain protective measures are available for specific susceptible groups and individuals at risk.

- Administration of vaccine: - The other control measure is the vaccine. Vaccines against infective hepatitis have been developed but are still in clinical trials stage and it may take some more time before they are widely used in the prevention of infectious hepatitis.

MANAGEMENT OF HEPATITIS & DIETETICS:

Majority of the patients with Hepatitis do not required drastic interventions. It is advisable to encourage patients to consume a normal diet. However, patients consuming alcohol are mostly malnourished and hence required serious nutritional interventions.

Nutritional Management

The objective of nutritional management of hepatitis are:

i) to relieve symptoms
ii) to aid in the regeneration of liver tissues
iii) to prevent further liver damage

A high protein, high carbohydrate moderate fat is recommended. Small attractive meals at regular intervals are better tolerated. Overfeeding should be avoided.

1. **Proteins: -**For the liver cells to regenerate an adequate supply of proteins is needed. With severe jaundice, 40 g while in mild jaundice 60-80 g of protein is permitted.

2. **Fats: -** Fats make the food more palatable and increase calorie intake. In severe jaundice 20 g and in moderate jaundice 20-30 g of fats per day are recommended. In other cases of jaundice, fate needs to be restricted only if there is obstruction to fat digestion and produces fatty diarrhea.

3. **Carbohydrates:** -High carbohydrates content in the diet is essential to supply enough calories so that tissue proteins are not broken down for energy purpose. When fever, nausea and vomiting are present, intravenous glucose is suggested. As soon as the patient can take oral feeds; intravenous feeding should be stopped and fruit juices, sugar, jaggery and honey are given not only to provide carbohydrate but also to supply adequate electrolytes.

4. **Vitamins: -**They are essential to regenerate liver cells. 500 mg of vitamin C, 10 mg of vitamin K and supplements of B complex are essential to meet the daily needs. If anorexia, nausea or vomiting is there, the vitamins may be given by injection.

5. **Minerals: -**If food is not taken orally then a careful watch should be kept on the sodium and potassium levels. Oral feeds of fruit juice, vegetable and meat soups with added salt, given orally or through a nasogastric tube help in maintaining the electrolyte balance. Normal level of sodium and potassium in the body fluids must be maintained through supplements.

6. **Foods included: -** Cereal porridge, soft chapattis, breads rice, skimmed milk, tapioca, potato, yam, fruit, fruit juices, sugar, jaggery, honey, biscuits, soft custard without butter cream and non-stimulant beverages.

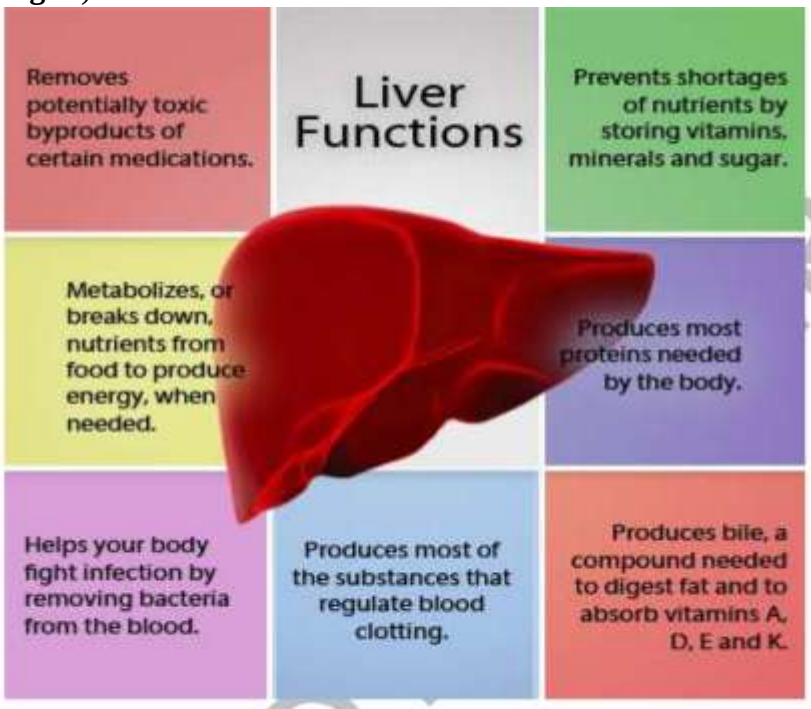
Sample Menu

Table 11.1 (2500 Kcal Diet-Chart)

Meal	Menu	Amount
Early Morning	Tea with sugar Glucose Biscuit	1 Cup (150 ml) with 3 tsp. 2 No.
Breakfast	Cornflakes/ Wheat flakes with milk and honey (High Carbohydrate) Swiss rolls (sponge cake with jam) Fruit (apple, papaya, orange) Mango Juice	½ big bowl (30gm) with 150 ml and 3 tsp honey 2 rolls 1 No. (150 gm) 1 Glass (250 ml)
10:00 am	Coconut water	1 Glass (250ml)
Midmorning	Aloo paneer chat Roohafza water	1 katorie cooked 1 Glass (250 ml)
Lunch	Roti Rice Seasonal Vegetable (min. oil) Dal (min. oil) Curd Rasgulla Oil	2 No. 1½ Katorie 1 Katorie cooked 1 Katorie cooked 1 Katorie 2 No. 1 – 1½
Evening Tea	Banana shake with ice cream Channa	1 glass (250 ml) 1 katorie (50 gms)
Dinner	Roti Rice Dal (minimum oil) Seasonal Vegetable (minimum oil) Curd Petha (Indian Dessert) Oil	2 No. 1½ Katorie cooked 1 Katorie cooked 1 Katorie cooked 1 Katorie 2 No. 1-1½ tsp.
Bed Time	Orange Juice (high in Vitamin A and C) Jelly	1 glass (250 ml) 1 Big Bowl

JAUNDICE

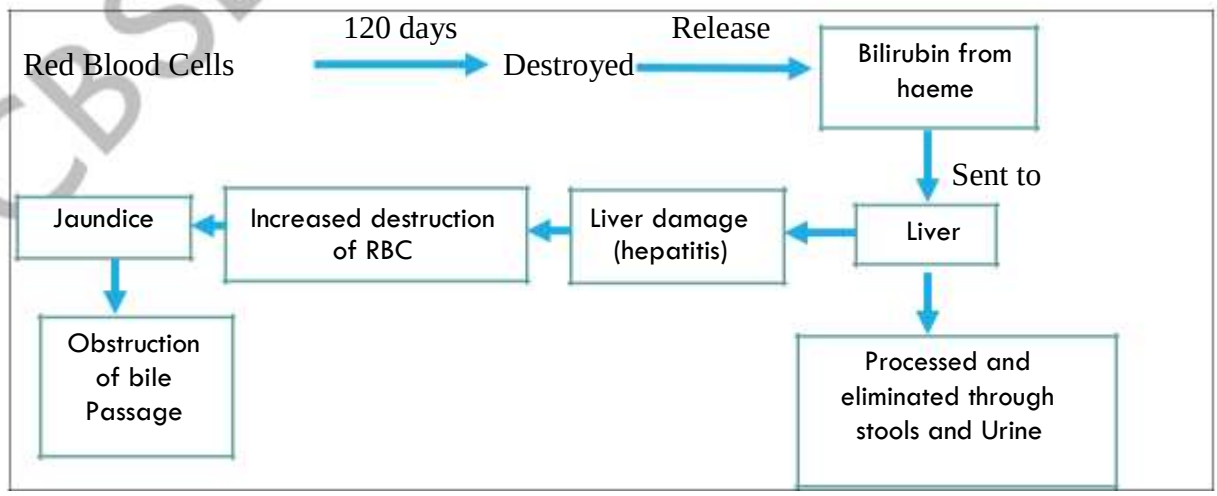
Jaundice is a term given to yellow discoloration of the skin, mucus membranes, sclera and body tissue because of accumulation of bile pigments in the blood. Jaundice is a common symptom for all liver diseases. It results due to increase levels of bilirubin in the blood. Jaundice is clinically detected when the bilirubin level is above **2.0 to 2.5 mg/dl**. (Normal level **0.2 to 0.8 mg/dl**).



CLINICAL SYMPTOMS AND PHYSIOLOGICAL CONDITIONS:

I. Causes:

Damage to liver cells leads to increase in bilirubin resulting in jaundice. After 120 days of life, RBC are broken and through a complex chemical reaction, bilirubin is produced. This is excreted in stools and urine along with bile. Problems like increased destruction of RBC, decreased functioning of the liver or obstruction to the flow of bile from the liver can result in jaundice. The figure below shows the production of jaundice.



Other causes of jaundice are pernicious anaemia and certain diseases affecting the liver such as typhoid, malaria, yellow fever and tuberculosis.

Figure 11.1 Discoloration of Eyes

Figure 11.2 Yellow pigmentation of the skin

II. Common symptoms of jaundice include:

- a yellow pigmentation of the skin and the whites of the eyes, normally starting at the head and spreading down the body
- pale stools
- the urine also appears dark yellow or brown in colour
- itchiness
- fatigue
- abdominal pain
- weight loss
- vomiting
- fever
- pale stools

III. Types of Jaundice

There are three types of jaundice namely:

1. Hemolytic jaundice

   It is also known as prehepatic jaundice. This relates to excessive destruction of RBC resulting in an increased bilirubin formation and anaemia. There is an increased unconjugated plasma bilirubin, which is excreted through the urine. This kind of jaundice is common in newborns, i.e. neonatal jaundice.

2. Hepatic jaundice

   In this, there is a normal bilirubin production. The liver cannot convert fat soluble bilirubin to the water soluble form. Hence, there is a decreased conjugation leading to hepatocyte damage (jaundice). Failure of about 80% or more of hepatic function is observed.

3. Obstructive Jaundice

It is referred to as post – hepatic jaundice. This results from the interference of normal flow of bile into the duodenum due to stones, tumors or inflammation of mucosa of the duct. This results in a backflow of bile in to the blood stream and is circulated in the body giving a yellow color.

MANAGEMENT OF JAUNDICE & DIETETICS

To remove excess bilirubin a generous intake of water is necessary. Hence Requirement is of more than 3 – 4 litre in a day. Thus, initially when jaundice is diagnosed preference should be given to a clear liquid diet every two hourly. This reduces the load on liver. Clear liquid includes fruit juices, dal or rice water, vegetable stalk, vegetable soup or chicken broth.

Once the patient tolerates this without any nausea or vomiting, start with a full liquid diet. This includes buttermilk, yogurt smoothie, liquid mixture of dal and rice or curd and rice or liquid porridge.

Within a day or two, start with soft easy to digest food and very low in fat. Water intake must be over 3 litres throughout the course of jaundice. Soft khichadi, porridge, curd rice and upma should be good. Be generous with carbohydrates, as it is required to build liver cells. Avoid any oil as it is processed in liver, which is already compromised due to jaundice. Coconut oil or ghee can be used sparingly (1 – 2 teaspoon/day).

Table 11.2 Foods that can be used liberally and best avoided in the diel of an individual suffering from Jaundice

Foods that can be used liberally	Foods to be avoided
1. **Sugarcane**: - Sugarcane has simple sugars that help rebuild liver cells. Chewing the sugarcane helps in removing the bile through the body. Or even sugarcane juice will help. Just ensure the juice is hygienic. Drink juice twice daily for better results.	1. Spicy and fried foods
2. **Banana**: - Banana is high in antioxidants and potassium. Both help in flushing out toxins from the liver. Crush ripe banana, add some honey and take this at least twice a day for good results.	2. Junk foods. Liver needs to produce more bile to digest these foods and that may aggravate the condition.
3. **Buttermilk**: - Buttermilk is light to digest. It has probiotics that are required for normal gastrointestinal function. Having buttermilk at least thrice a day is advisable.	3. Alcohol, coffee and tea add more toxins to the liver.
4. **Tomato juice**: - Tomatoes contain vitamin C and potassium which helps in detoxifying the liver.	4. Non-pasteurized milk which is high in microbes.
5. **Lemon**: - Lemon is high in antioxidants. It protects liver cells from further damage as it unblocks the bile duct from accumulated bile fluid.	5. Pulses and legumes
6. **Gooseberry**: - Gooseberry is rich in vitamin C that alleviates the symptoms of jaundice.	6. Non Vegetarian food as it involves liver for it metabolism.
7. **Barley**: - Barley has diuretic property. It helps to remove all toxins and bile from body through urine.	
8. **Wheat grass**: - Wheat grass triggers the enzymes involved in rejuvenating the liver cells. While juice of Wheat grass is very effective in normal functioning of liver.	

CHAPTER: 12 CELIAC DISEASE, LACTOSE INTOLERANCE & PEPTIC ULCER

(DEFINITION,CAUSES,CLINICALSYMPTOMS AND DIETARY MANAGEMENT)

***Learning Objectives*:**

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

1. Define Celiac disease, Lactose Intolerance & Peptic ulcer.
2. Explain the causes, clinical symptoms, complications of the above mentioned diseases, and
3. Describe the treatment and prevention with a main focus on diet therapy and dietary management.

Malabsorption Syndrome

Malabsorption syndrome is an alteration in the ability of the intestine to absorb nutrients adequately into the blood stream and it leads to severe malnutrition. Some common malabsorption syndromes are Celiac disease, Lactose Intolerance.

CELIAC DISEASE

Celiac disease often called gluten-sensitive enteropathy is a serious autoimmune disease that occurs in genetically predisposed people where the ingestion of gluten leads to damage in the small intestine. It is estimated to affect 1 in 100 people worldwide

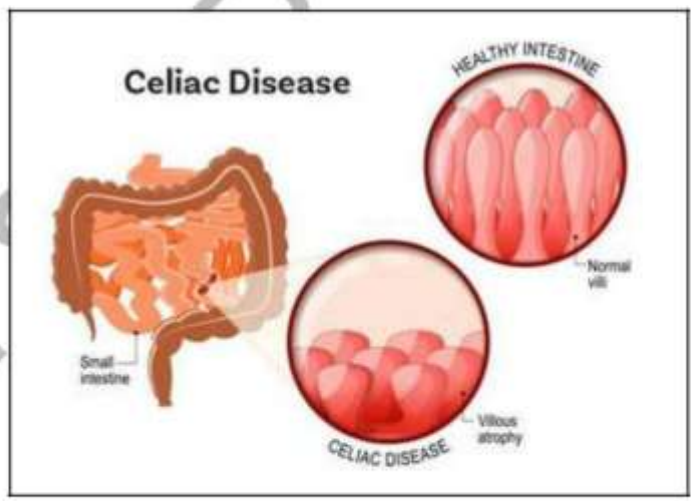


Figure 12.1 inflammation in small Intestine

SYMPTOMS & PHYSIOLOGICAL CONDITIONS

I. Causes:

Celiac disease is caused by an abnormal immune system reaction to the protein gluten, which is found in foods such as bread, pasta, cereals and biscuits**.**

In the case of coeliac disease, immune system mistakes one of the substances that makes up gluten, called gliadin, as a threat to the body. The antibodies that are produced cause the surface of intestine to become inflamed (red and swollen).

The surface of the intestine is usually covered with millions of tiny tube-shaped growths called villi. Villi increase the surface area of gut and help it to digest food more effectively. However, in celiac disease, the damage and inflammation to the lining of the gut flattens the villi, reducing their ability to help with digestion.

II. Symptoms

The signs and symptoms of celiac disease can vary greatly and differ in children and adults. Digestive signs and symptoms for adults include:

- Diarrhoea
- Fatigue
- Weight loss
- Bloating and gas
- Abdominal pain
- Nausea and vomiting
- Constipation

However, more than half the adults with celiac disease have signs and symptoms unrelated to the digestive system, including:

- Anaemia, usually from iron deficiency
- Loss of bone density (osteoporosis) or softening of bone (osteomalacia)
- Itchy, blistery skin rash
- Mouth ulcers
- Headaches and fatigue
- Nervous system injury, including numbness and tingling in the feet and hands, possible problems with balance, and cognitive impairment
- Joint pain
- Reduced functioning of the spleen.

III. Physiological conditions:

- Children presenting with celiac disease often will experience a decline in both height and weight growth velocity resulting in a decrease in the growth percentiles.
- Adults have diarrhea as a major symptom of celiac disease in approximately 50% of cases. They may also be diagnosed in the setting of anemia or osteoporosis.

IV. Complications

Chronic and sever form of celiac disease patients are at risk for several complications. These complications are following:

- Anaemia
- Dermatitis, herpetiformis
- Vitamin D deficiency, inadequate calcium absorption
- Vitamin K deficiency
- Infertility, increases risk of abortion, delayed puberty, delayed growth

MANAGEMENT OF CELIAC DISEASE AND DIETETICS

Treatment:

At present, the only effective treatment is a lifelong gluten-free diet. No medication exists that prevents damage or prevents the body from attacking the gut when gluten is present. Strict adherence to the diet helps the intestine heal, leading to resolution of all symptoms in most cases and, depending on how soon the diet is begun, can also eliminate the heightened risk of osteoporosis and intestinal cancer and in some cases sterility. The diet can be cumbersome; failure to comply with the diet may cause relapse.

Dietitian input is generally requested to ensure the person is aware which foods contain gluten, which foods are safe, and how to have a balanced diet despite the limitations. Gluten-free products are usually more expensive and harder to find than common gluten-containing foods.

The term "gluten-free" is generally used to indicate a supposed harmless level of gluten rather than a complete absence. The exact level at which gluten is harmless is uncertain. Gluten-free diet improves healthcare-related quality of life, and strict adherence to the diet gives more benefit than incomplete adherence. Nevertheless, gluten-free diet doesn't completely normalize the quality of life

Dietary guidelines in celiac disease:

- Avoiding foods with gluten, a protein found naturally in wheat, rye, and barley, is critical in treating celiac disease. Removing gluten from diet will improve symptoms, heal damage to small intestine, and prevent further damage over time. Many healthy, gluten-free foods and products are available in the market.

- Foods such as meat, fish, fruits, vegetables, rice, and potatoes without additives or seasonings do not contain gluten and are part of a well-balanced diet. Gluten-free types of bread, pasta, and other foods that are now easier to find in stores and at special food companies. Potato, rice, soy, amaranth, quinoa, buckwheat, or bean flour instead of wheat flour can be substituted in the diet of a celiac.

Table 12.1 Diet for Celiac disease

Food	Gluten Free	Gluten Containing
Cereals, Flours, Cakes & Biscuits	Arrowroot, buckwheat, corn/ maize, rice, rice bran, rice flour, sago, soya flour	Wheat flour, whole wheat, wheat bran, barley, rye flour, pasta, noodles, semolina
Dairy products & eggs	Eggs, milk, cream, butter, soya products, curd, paneer	Some yoghurts & some cheese spreads
Puddings	Sago, rice, custard	Semolina, sponge pudding, pastry
Beverages	Tea, coffee, herb tea, fruit juice, cold drink & most alcoholic drinks	Barley based drinks, barley fruit drinks, malted drinks & beer
Soups & sauces	Gluten-free if thickened with suitable flour	
Preserves & confectionary	Jam, marmalade, sugar, honey, molasses, golden syrup & some brands of chocolate and sweets	Confectionery containing flour
Dry fruits & nuts	All	
Miscellaneous	Salt, pepper, vinegar, herbs & spices, tamarind, yeast, most food	Some pepper compounds, ready mix spices, some seasoning

	colourings & essences	powders

Table 12.2 Sample Menu (1400 Kcal Diet Chart)

Meal	Menu	Amount
Early morning	Coconut water Arrowroot biscuit	1 Glass 2 No.
Breakfast	Oats/ sago porridge Fruit (apple, banana, orange) Poha (no wheat) Or Idli/ Utpam (rice made)	½ big bowl 1 (100-150 gm) 1 Katorie 2 No.
Lunch	Besan roti Rice Seasonal Vegetable Dal Curd Fruit Custard Cooking oil	2 No. 1 Katorie cooked 1 Katorie cooked 1 Katorie cooked 1 Katorie 1 Katorie 2 tsp.
Evening Tea	Milk shake (banana, apple) Arrowroot biscuit	1 Glass 2 No.
Dinner	Besan roti Pulao Seasonal Vegetable Dal Curd Rice kheer Cooking oil	2 No. 1 Katorie cooked 1 Katorie cooked 1 Katorie cooked 1 Katorie 1 Katorie 2 tsp.
Bed time	Apple juice	1 glass (250 ml)

Note: Avoid wheat and wheat products

LACTOSE INTOLERANCE

Lactose intolerance: The inability to digest lactose, a component of milk and some other dairy products. The basis for lactose intolerance is the lack of an enzyme called lactase in the small intestine. The most common symptoms of lactose intolerance are diarrhea, bloating, and gas.

SYMPTOMS & PHYSIOLOGICAL CONDITIONS

I. Causes

There are two main types of lactose intolerance, which have different causes.

Primary Lactose Intolerance:
Primary lactose intolerance is the most common. It is caused by a decrease in lactase production with age, so that lactose becomes poorly absorbed.

Secondary lactose intolerance:
This form of lactose intolerance occurs when your small intestine decreases lactase production after an illness, injury or surgery involving your small intestine. Among the diseases associated with secondary lactose intolerance are celiac disease, bacterial overgrowth and Crohn's disease. Another cause of lactase deficiency is secondary lactase deficiency. This type of deficiency is due to diseases that destroy the lining of the small intestine along with the lactase. An example of such a disease is celiac disease (sprue).

Congenital or developmental lactose intolerance:
It's possible, but rare, for babies to be born with lactose intolerance caused by a complete absence of lactase activity. This disorder is passed from generation to generation in a pattern of inheritance called autosomal recessive, meaning that both the mother and the father must pass on the same gene variant for a child to be affected. Premature infants may also have lactose intolerance because of an insufficient lactase level. Lactase deficiency may occur because of a congenital absence (absent from birth) of lactase due to a mutation in the gene that is responsible for producing lactase. This is a very rare cause of lactase deficiency, and the symptoms of this type of lactase deficiency begin shortly after birth.

II. Symptoms-

A person with lactose intolerance will experience symptoms after consuming milk or some dairy product that contains lactose. Symptoms can range from mild discomfort to a severe reaction, depending on how much lactase the person produces, and how much dairy products they consume.

Symptoms include:

- Flatulence
- Bloating
- Abdominal pains
- Nausea
- Diarrhoea

The person may have a sudden urge to use the bathroom 1 to 2 hours after consuming lactose. In severe cases, dehydration may occur.
The most common cause of lactase deficiency is a decrease in the amount of lactase that occurs after childhood and persists into adulthood, referred to as adult-type hypolactasia. This decrease in lactase is genetically programmed.

MANAGEMENT OF LACTOSE INTOLERANCE AND DIETETICS

Treatment:

There's currently no way to boost body's production of lactase, but one can usually avoid the discomfort of lactose intolerance by:

- Avoiding large servings of milk and other dairy products
- Including small servings of dairy products in your regular meals
- Eating and drinking lactose-reduced ice cream and milk
- Experimenting with an assortment of dairy products**.** Not all dairy products have the same amount of lactose. For example, hard cheeses, such as Swiss or cheddar, have small amounts of lactose and generally cause no symptoms.
- Buying lactose-reduced or lactose-free products**.**
- Using lactase enzyme tablets or drops**.** Tablets or drops containing the lactase enzyme (Dairy Ease, Lactaid, others) may help digest dairy products. Not everyone with lactose intolerance is helped by these products.

Reducing the dairy products doesn't mean that we can't get enough calcium. Calcium is found in many other foods, such as:

- Broccoli
- Calcium-fortified products, such as breads and juices
- Milk substitutes, such as soy milk and rice milk
- Oranges
- Pinto beans
- Spinach

Also make sure to get enough vitamin D, which is typically supplied in fortified milk. Eggs, liver and yogurt also contain vitamin D, and body makes vitamin D in the sun. Even without restricting dairy foods, though, many adults don't get enough vitamin D.

Dietary tips for planning a menu for lactose intolerance patient

- avoid milk, paneer and milk based beverages or desserts
- all the food labels should be read before using, as that should be lactose free
- if nutrition supplement is given it should be lactose free

PEPTIC ULCERS

A peptic ulcer is a sore on the lining of stomach or duodenum. Rarely, a peptic ulcer may develop just above stomach in oesophagus called as oesophageal ulcer.

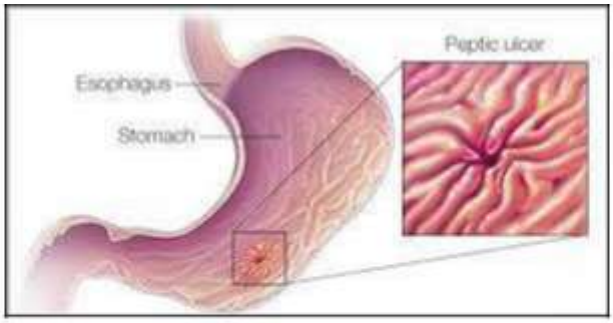


Figure 12.2 Stomach and duodenum with ulcer

SYMPTOMS & PHYSIOLOGICAL CONDITIONS

I. **Causes**

- long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs), such as Aspirin and Ibuprofen
- an infection with the bacteria *Helicobacter pylori*
- Rare cancerous and noncancerous tumours in the stomach, duodenum, or pancreas— known as Zollinger-Ellison syndrome (ZES)
- Peptic ulcers occur when acid in the digestive tract eats away the inner surface of the stomach or small intestine. The acid can create a painful open sore that may bleed. Digestive tract is coated with a mucous layer that normally protects against acid. But if the amount of acid is increased or the amount of mucus is decreased, it could develop an ulcer.

Some other causes include:

- A bacterium. Helicobacter pylori bacteria commonly lives in the mucous layer that covers and protects tissues that line the stomach and small intestine. Often, the H. pylori bacterium causes no problems, but it can cause inflammation of the stomach's inner layer, producing an ulcer.
- Regular use of certain pain relievers. Taking Aspirin, as well as certain nonsteroidal anti-inflammatory drugs (NSAIDs) can irritate or inflame the lining of stomach and small intestine. Peptic ulcers are more common in older adults who take these pain medications frequently or in people who take these medications for osteoarthritis.
- Other medications. Taking certain other medications along with NSAIDs, such as steroids, anticoagulants, low-dose Aspirin can greatly increase the chance of developing ulcers.

It is not uncommon for people to have a peptic ulcer and no symptoms at all. However, one of the most common symptoms of peptic ulcers is indigestion-like pain. The pain may occur anywhere from the belly button to the breastbone. It can be brief or may last for hours. It is more severe when the stomach is empty or right after eating (depending on where it is located); sometimes it is worse during sleep. Eating certain foods may relieve it, and some foods may make it worse.

Other symptoms may include:

- difficulty swallowing food
- food that is eaten comes back up
- feeling unwell after eating
- weight loss
- loss of appetite
- Over-the-counter medications can often provide relief for these symptoms. Rarely, ulcers can cause severe signs and symptoms, such as:
- vomiting blood
- black and tarry stools, or stools with dark red blood
- nausea and vomiting that is especially persistent and severe

MANAGEMENT OF PEPTIC ULCER & DIETETICS

Treatment:-

The type of treatment usually depends on what caused the peptic ulcer. Treatment will focus on either lowering stomach acid levels so that the ulcer can heal, or eradicating the *H. pylori* infection.

H. pylori infection treatment
Patients infected with *H. pylori* will usually need antibiotics. This treatment is effective in most patients, and the ulcer will start to disappear within days. When treatment is over, the individual will have to be tested again to make sure the *H. pylori* have gone.

Non-steroidal anti-inflammatory drugs
If the ulcer comes from NSAIDs, the patient will have to stop taking them. If the person cannot stop taking NSAIDs, the doctor may minimize the dosage and review the patient's need for them later.

Follow-up treatment
Even after the ulcer has healed and treatment has been completed, the patient may still have indigestion. In such cases, the doctor might advise some diet and lifestyle changes. In severe cases with bleeding, an endoscopy may be needed to stop the bleeding at the ulcer site.

Dietary Management:

Dietary changes can be important for treating and preventing peptic ulcers.

It is important to avoid foods and flavourings that induce the stomach to produce acids, such as chili powder, garlic, black pepper, and caffeine. Alcohol has the same effect on the stomach and should also be avoided.

The diet should contain plenty of foods that provide plenty of vitamin A and fibre that dissolves easily. These can include:

Sources of soluble fibre

- Oats
- Apples
- Oranges

- Carrots
- legumes
- flax seeds
- Nuts
- Barley

Sources of vitamin A

- liver
- broccoli
- kale
- spinach
- sweet potatoes

Foods that are high in antioxidants, such as a range of berries and snap peas, are recommended. Green tea has also demonstrated a restrictive effect on the growth of *H. pylori* under laboratory conditions. A balanced diet filled with fruits and vegetables and lacking in intense spices and flavours should assist with a peptic ulcer.

Table 12.3 Sample Menu in Peptic Ulcer (1600 Kcal Diet Chart)

Meal	Menu	Amount
Early Morning	Coconut water (no tea) Biscuit	1 Glass 2 No.
Breakfast	Suji Upma/ Idli (less spicy) Banana Apple Juice	1 katorie/ 2 No. 1 No. 1 Glass
Mid-morning	Butter Milk	1 Glass
Lunch	Khichri Soft Vegetables (lauki/ tinda/ pumpkin/ potato) Washed dal (without husk) Curd Cooking oil	1 big bowl 1 katorie cooked 1 katorie cooked 1 katorie 1-1½ tsp
Evening Tea	Cold Milk Biscuit	1 cup 2 No.
Dinner	Boiled rice Soft Vegetables (lauki/ tinda/ pumpkin/ potato) Washed dal (without husk) Curd Cooking oil	1 big bowl 1 katorie cooked 1 katorie cooked 1 katorie 1-1½ tsp

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UNIT 4: FOOD SAFETY AND QUALITY CONTROL

CHAPTER 13: FOOD HAZARDS

CHAPTER 14: PERSONAL HYGIENE & FOOD HYGIENE

CHAPTER 15: FOOD ADULTERATION

CHAPTER 16: READING AND UNDERSTANDING FOOD LABELS

CHAPTER 17: HFSS FOODS AND THEIR IMPLICATIONS

CHAPTER 13: FOOD HAZARDS

***Learning Objectives*:**
After reading this chapter, the students will be able to:

1. Define the term food hazards,
2. Differentiate between different types of food hazards(physical ,chemical & biological),
3. Explain the causes, concepts and preventive measures of cholera, typhoid & salmonellosis.

Figure 13.1 Types of Food Hazards

A general definition of a hazard is a conditions or contaminants that can cause illness or injury. A food hazard refers to any agent with the potential to cause adverse health consequences for consumers. It occurs when food is exposed to hazardous agents which result in contamination of that food. HACCP (Hazard Analysis Critical Control point) is a food safety system that is recognised worldwide to determine significant hazards pertaining to specific products and processes. Food hazards may be biological, chemical and physical. Let's now discuss these hazards in detail.

1. **Biological hazards**: It includes microorganisms such as bacteria, viruses, yeasts, molds and parasites. Some of these are pathogens or may produce toxins. A pathogenic microorganism causes disease and can vary in the degree of severity. Examples of biological hazards include *Salmonella*, *E. coli* and *Clostridium botulinum*. These hazards can come from raw materials or from food-processing steps used to make the final product. Microorganisms live everywhere: air, dirt, fresh and salt water, skin, hair, animal fur and plants. Microorganisms are classified into various groups. Since microorganisms are so widespread, it is important to understand when to be concerned about them and how to deal with them. Although thousands of kinds of microorganisms exist, only a few pose hazards to humans. Many microorganisms are beneficial. Certain kinds of yeast, molds and bacteria help make cheese, sour cream, yogurt and other fermented dairy products. Particular kinds of yeast are used in making beer, wine and other fermented beverages. We add these microorganisms to our foods intentionally, and they cause no harm. In fact, studies show that some of these microorganisms contribute to good health. In HACCP, "hazards" refer to conditions or contaminants in foods that can cause illness or injury.

2. Chemical hazards: The chemical hazards vary in the aspect of production they are related to. Some potential chemical hazards could be prior to a processor receiving product, such as the improper use of pesticides or antimicrobial residues. Others could be chemicals used on processing equipment such as oils used on equipment or sanitizers. Furthermore, other potential chemical hazards may include substances that are safe or used in processing at certain levels but can cause illness or injury if consumed at too high of a concentration, such as sodium nitrite or antimicrobial solutions used in intervention steps. The HACCP team evaluates in the hazard analysis the likelihood of the chemical to cause illness or injury. Chemical contamination can happen at any stage in food production and processing. Chemicals can be helpful and are purposefully used with some foods, such as pesticides on fruits and vegetables. Packaging materials that are in direct contact with ingredients or the product can be a source of incidental chemicals, such as sanitizers or inks. Chemicals are not hazardous if properly used or controlled.

3. Physical hazards: It include objects that are hard or sharp such as glass, metal, plastic, stones, pits, wood, or even bone. Physical hazards can lead to injuries such as choking, cuts, or broken teeth. Some foreign material in food products may not be a physical hazard but rather an undesirable foreign material such as hair, insects, or sand that are not likely to cause injuries. Physical hazards include any potentially harmful extraneous matter not normally found in food. When a consumer mistakenly eats the foreign material or object, it is likely to cause choking, injury or other adverse health effects. Physical hazards are the most commonly reported consumer complaints because the injury occurs immediately or soon after eating, and the source of the hazard is often easy to identify.

FOOD BORNE DISEASE

Food borne illness usually result from a few of the following reasons:

1. Consuming food obtained from infected plant or animal.
2. Food contaminated by insects, flies, rodents, etc.
3. Food which comes in the contact with sewage water or sewage polluted water.
4. Food handled in an unhygienic way.

Microorganisms like *salmonella*, *clostridium* and *staphylococci* are responsible for the majority of food-borne illness. The main diseases which are transmitted by food are typhoid, dysentery, tuberculosis, infectious hepatitis and cholera.

Some of the common symptoms of food illness are given below as food-borne illness generally affects the gastrointestinal tract. Symptoms includes nausea, vomiting, abdominal pain & diarrhoea.

Food and Personal Hygiene:

Hygiene is an important factor in order to prevent a food illness. It is so because food is the most potential medium through which disease- carrying organisms can be transmitted. So, it becomes important for food handlers to follow high standard of food hygiene. Hence one should follow the following practices:

1. Wash your hands with soap or water. Dry them properly with a towel or a hand dryer.
2. Keep your nails short and clean.
3. If you have cut or wounds on hands or fingers, cover them with proper dressing before handling food.
4. Do not touch hair, nose or any other potentially hazardous area or thing while preparing food
5. Cover your mouth and nose while coughing and sneezing.
6. Store the food at proper temperature.

CHOLERA:

Cholera is an acute infection of the small intestine that cause severe watery diarrhoea, which can lead to dehydration and even death, if untreated. It is caused by eating food or drinking water contaminated with a bacterium called *Vibrio cholerae.* Cholera has been known and feared for centuries because of its occurrence in epidemics resulting in high mortality and social disruption.

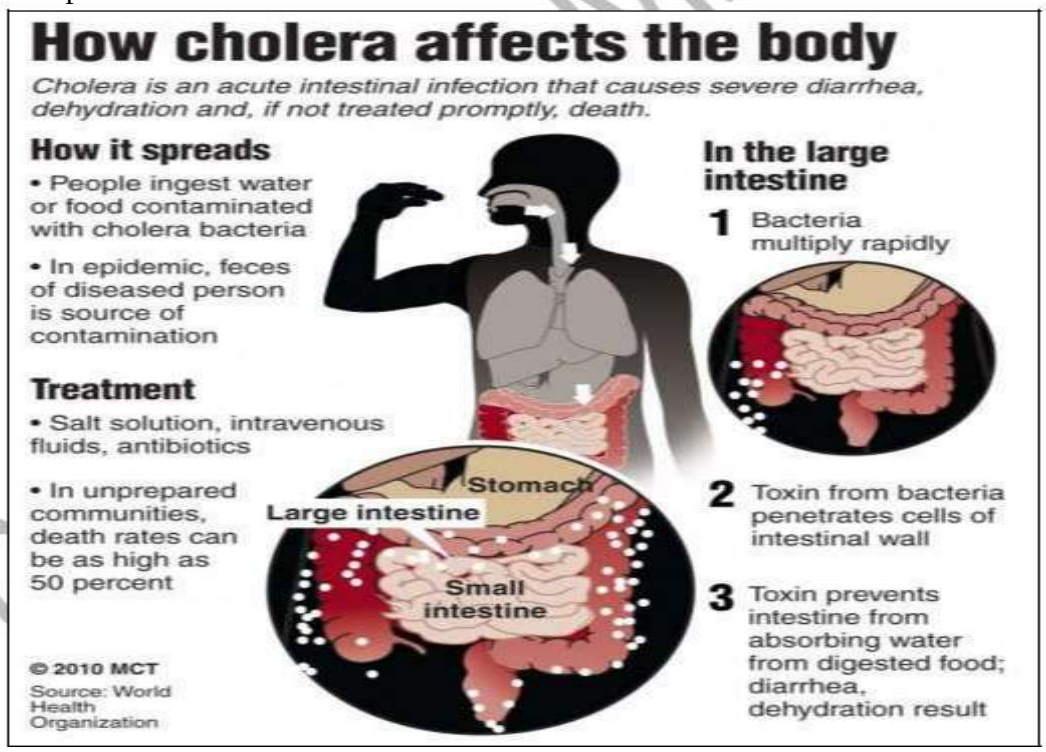

Figure 13.2 Transmission of Cholera

Causes:
Vibrio cholerae is usually found in food or water contaminated by faces from a person with the infection. Common sources include:

- Municipal water supplies
- Ice made from municipal water
- Foods and drinks sold by street vendors
- Vegetable grown with water containing human wastes
- Raw or undercooked fish and seafood caught in waters polluted with sewage

Incubation period: Incubation period for cholera infection is from few hours to 5 days, but commonly it is 1 to 2 days.

Carriers in cholera: A carried is a person who is apparently healthy but is excreting the causative organism – *Vibrio cholerae*.

Who gets the disease?

Age & Sex: Cholera affects all ages, and both sexes. In areas, where cholera is endemic, children are affected most.

Economic Status: Occurrence of cholera is more in the low socio-economic groups mainly because of poor hygiene.

Immunity: Affected person gets temporary immunity from previous episodes for future attacks. Such immunity will however be effective from 10 days to 7 months only after the onset of an attack.

Symptoms

- Watery diarrhoea
- Vomiting
- Dehydration
- Rapid heart rate
- Loss of skin elasticity (the ability to return to original position quickly if pinched)
- Dry mucous membranes, including the inside of the mouth, throat, nose and eyelids
- Low blood pressure
- Thirst
- Reduce urine output
- Muscle cramps

Management, Prevention and Measures

Management: Since dehydration is the most common manifestation of cholera the very first step in the management of cholera is control of dehydration.

With rehydration i.e., by making up of losses fluids and salts (electrolytes) cholera can now be effectively treated. The rehydration can be oral or intravenous. By this treatment, the death rate due to cholera can be reduced to 1 percent. World Health organisation recommends the use of oral fluid.

The amount of oral fluid given depends upon extent of dehydration.

- In the case of mild dehydration i.e., the patient is thirsty, pulse is normal, tongue moist, skin pinch retracts immediately, and the volume of oral fluid to be given would be 50ml per kg body weight to be consumed within 4 hours.
- In case of moderate dehydration i.e., when the patient is thirsty, pulse is rapid and weak , eyes are sunken and tongue is dry and volume of oral fluid to be given should be 100 ml per kg body weight to be consumed within 4 hours.
- In case of severe dehydration i.e., when the patient is drowsy, cold, sweaty, pulse is feeble, blood pressure not recordable and skin pinch retracts very slowly, tongue is very dry, the patient must immediately be shifted to a nearby hospital.

PREVENTION AND CONTROL:

Sanitation measure-

1. Water control: As water is the most important vehicle for transmission of cholera, adequate steps must be taken for safe and adequate water supply.
2. Excreta disposal: Economical and effective excreta disposal must be undertaken.
3. Food sanitation: As food forms an important vehicle of infection, effective steps must be taken for proper food sanitation.
4. Disinfections: The most effective disinfectant are cresol and bleaching powder. The patient stools, vomit, clothes and other items that have been contaminated must be disinfected.

Vaccination-Vaccination against cholera as a specific prophylactic (medicine to prevent cholera) is available. Children below 5 yrs. who are main victims of cholera in endemic areas are poorly protected with the current vaccine, the degree of protection tends to increase with age.

TYPHOID

Typhoid is a bacterial infection that can lead to a high fever, diarrhea, and vomiting. Typhoid fever is a systemic infection caused by Salmonella typhi, usually through ingestion of contaminated food or water. It occurs predominantly in association with poor sanitation and lack of clean drinking water.

Typhoid is manifested by fever with the gradual onset of headache, prolonged fever associated with anorexia. Non-sweating fever, mental dullness may be observed sometimes.

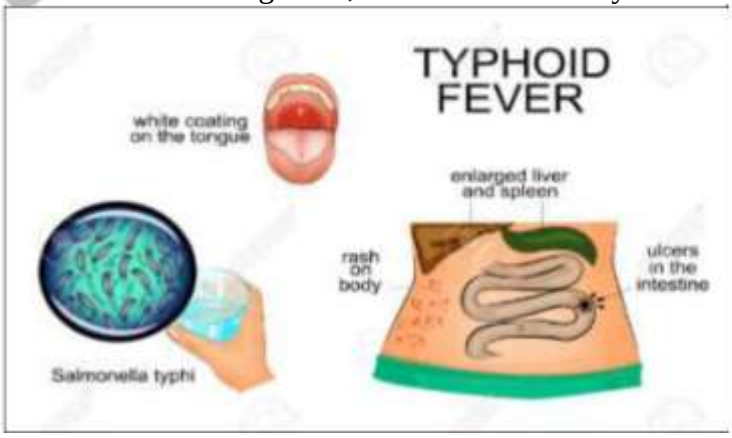

Figure 13.3 Transmission of Typhoid

Causes:

A microorganism Salmonella typhi is the causative organism and mainly it affects the intestine and liberates toxins into blood circulation.

The main mode of infection is by faecal-oral route.
The typhoid infection mainly spread by water and food contaminated by faeces or urine of typhoid patients or carriers of the disease. There are certain social factors which contribution to the infection. These include:

1. The prevailing wrong defecation practices because of which faecal pollution of soil occurs leading to spread of infection through water, food and flies.
2. Low standard of personal hygiene.
3. Unhygienic health practices.
4. Low standards of food hygiene.
5. Illiteracy and health ignorance.

Carriers in Typhoid: A small number who have suffered from typhoid may become carriers. The carriers may excrete the organism in faeces, urine or bile.

Incubation period: The disease takes usually 10-15 days with a range of 4 days to 3 weeks.

Period of communicability: Period of communicability for typhoid lasts as long as typhoid bacilli appear in the excreta.

Generally everybody is susceptible to the disease typhoid. Resistance to small infecting doses follows recovery from clinical disease or from unapparent (sub-clinical) infection or from active immunization. In areas where typhoid is endemic attack rates usually decline with age.

Management, Prevention and Measures

Three lines of measures can be described against the control and prevention of typhoid fever. They are:

1. Control of reservoir: The reservoir of infection for typhoid fever exists in patients, contacts and carriers. Isolation of cases is essential to prevent the spread of the infection. Appropriate treatment should be ensured by proper medical care. Since patient's stools, urine and is articles are the main sources of infection in typhoid fever, they should be properly disinfected.

2. Control of sanitation: Following measures are included:
    - Protection, purification and chlorination of public water supplies.
    - Sanitary disposal of human excreta.
    - Control of fly breeding.
    - Boiling or pasteurisation of milk and dairy products.
    - Identification and adequate supervision of typhoid carriers.

3. Immunization: Vaccine is available for immunization against typhoid fever. While improved sanitation ad strict domestic and personal hygiene are primary in preventing typhoid, immunization has a complimentary role. Though immunization does not offer 100 percent protection against typhoid, it has got a major role in prevention.

Management

In case of any prolonged fever, it is essential to seek proper medical attention. Once the diagnosis of the disease is confirmed clinically and bacteriologically (biochemically) specific treatment should be administered under strict medical care. It is essential that medical treatment for typhoid should be under strict medical care.

Proper nutrition and dietary care should be taken since the gastro-intestinal system is involved. Authentic advice from qualified medical people should be obtained.

SALMONELLOSIS

Salmonella infection (salmonellosis) is a common bacterial disease that affects the intestinal tract. Salmonella bacteria typically live in animal and human intestines and are shed through faeces. Humans become infected most frequently through contaminated water or food.

Typically, people with salmonella infection have no symptoms. Others develop diarrhoea, fever and abdominal cramps within eight to 72 hours. Most healthy people recover within a few days without specific treatment.

In some cases, the diarrhoea associated with salmonella infection can be so dehydrating as to require prompt medical attention. Life-threatening complications also may develop if the infection spreads beyond your intestines. The risk of acquiring salmonella infection is higher if you travel to countries with poor sanitation.

Causes:

Salmonella bacteria live in the intestines of people, animals and birds. Most people are infected with salmonella by eating foods that have been contaminated by faeces. Commonly infected foods include:

- Raw meat, poultry and seafood. Faeces may get onto raw meat and poultry during the butchering process. Seafood may be contaminated if harvested from contaminated water.
- Raw eggs. While an egg's shell may seem to be a perfect barrier to contamination, some infected chickens produce eggs that contain salmonella before the shell is even formed. Raw eggs are used in homemade versions of mayonnaise and hollandaise sauce.
- Fruits and vegetables. Some fresh produce, particularly imported varieties, may be hydrated in the field or washed during processing with water contaminated with salmonella. Contamination also can occur in the kitchen, when juices from raw meat and poultry come into contact with uncooked foods, such as salads.

Management, Prevention and Measures

Preventive methods are especially important when preparing food or providing care for infants, older adults and people with weakened immune systems. Be sure to cook food thoroughly and refrigerate or freeze food promptly.

Wash your hands

Washing your hands thoroughly can help prevent the transfer of salmonella bacteria to your mouth or to any food you're preparing. Wash your hands after you:

- Use the toilet
- Change a diaper
- Handle raw meat or poultry
- Clean up pet faeces
- Touch reptiles or birds

Keep things separate

To prevent cross-contamination:

- Store raw meat, poultry and seafood away from other foods in your refrigerator
- If possible, have two cutting boards in your kitchen — one for raw meat and the other for fruits and vegetables
- Never place cooked food on an unwashed plate that previously held raw meat

Avoid eating raw eggs

Cookie dough, homemade ice cream and eggnog all contain raw eggs. If you must consume raw eggs, make sure they've been pasteurized.

CHAPTER 14: PERSONAL HYGIENE & FOOD HYGIENE

***Learning Objectives*:**

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

1. Define the terms food hygiene, food safety & food sanitation,
2. Enumerate the scope of environmental sanitation,
3. List the various habits included in maintenance of personal hygiene.

The human body can provide places for disease-causing germs and parasites to grow and multiply. These places include the skin and in and around the openings to the body. It is less likely that germs and parasites will get inside the body if people have good personal hygiene habits. Maintaining personal hygiene is essential for more than one reason; social, health, personal, psychological or just as a way of life. Maintaining a good standard of hygiene helps keep infections, illnesses and bad odors at bay. The importance of hygiene should be taught from an early age to help cultivate good habits. Personal hygiene can be defined as an act of maintaining cleanliness and grooming of the external body. Maintaining good personal hygiene consists of bathing, washing your hands, brushing teeth and sporting clean clothing. Additionally, it is also about making safe and hygienic decisions when you are around others.

One of the most fool proof ways to safeguard yourself and others from illness is through good personal hygiene. This means cleaning your hands, especially, but additionally your body. Good personal hygiene not only enhances your overall appearance, its importance is directly related to prevention of diseases, infections, and unpleasant odours.

GOOD PERSONAL HYGIENE

Good personal hygiene habits include:

- Washing the body often. If possible, everybody should have a shower or a bath every day. However, there may be times when this is not possible, for example, when people are out camping or there is a shortage of water
- If this happens, a swim or a wash all over the body with a wet sponge or cloth will do
- Cleaning the teeth at least once a day. Brushing the teeth after each meal is the best way of making sure that gum disease and tooth decay are avoided. It is very important to clean teeth after breakfast and immediately before going to bed
- washing the hair with soap or shampoo at least once a week
- washing hands with soap after going to the toilet
- Washing hands with soap before preparing and/or eating food. During normal daily activities, such as working and playing, disease causing germs may get onto the hands and under the nails. If the germs are not washed off before preparing food or eating, they may get onto the food
- Changing into clean clothes. Dirty clothes should be washed with laundry soap before wearing them again
- Hanging clothes in the sun to dry. The sun's rays will kill some disease-causing germs and parasites
- Turning away from other people and covering the nose and mouth with a tissue or the hand when coughing or sneezing. If this is not done, droplets of liquid containing germs from the nose and mouth will be spread in the air and other people can breathe them in, or the droplets can get onto food.

Types of personal hygiene

Each person's idea of personal hygiene differs. These main categories are a useful place to start for building good hygiene habits:

Toilet hygiene

Wash your hands after you use the restroom. Scrub with soap for 20 to 30 seconds, and be sure to clean between your fingers, on the back of your hands, and under your nails. Rinse with warm water, and dry with a clean towel.

If you don't have running water or soap, an alcohol-based hand sanitizer will also work. Use one that's at least 60 percent alcohol.

Shower hygiene

Personal preference may dictate how often you wish to shower, but most people will benefit from a rinse at least every other day. Showering with soap helps rinse away dead skin cells, bacteria, and oils.

You should also wash your hair at least twice a week. Shampooing your hair and scalp helps remove skin build up and protects against oily residues that can irritate your skin.

Nail hygiene

Trim your nails regularly to keep them short and clean. Brush under them with a nail brush or washcloth to rinse away build up, dirt, and germs.

Tidying your nails helps you prevent spreading germs into your mouth and other body openings. You should also avoid biting your nails.

Teeth hygiene

Good dental hygiene is about more than just pearly white teeth. Caring for your teeth and gums is a smart way to prevent gum diseases and cavities.

Brush at least twice a day for 2 minutes. Aim to brush after you wake up and before bed. If you can, brush after every meal, too. Floss between your teeth daily, and ask your dentist about using an antibacterial mouthwash.

These two steps can help prevent tooth decay and eliminate pockets where bacteria and germs can build up.

Sickness hygiene

If you're not feeling well, you should take steps to keep from spreading germs to others. This includes covering your mouth and nose when sneezing, wiping down shared surfaces with an antibacterial wipe, and not sharing any utensils or electronics. Also, immediately throw away any soiled tissues.

Hands hygiene

Germs on your hands can easily enter your body through your mouth, nose, eyes, or ears. Wash your hands:

- when you handle food
- before you eat
- if you handle garbage
- when you sneeze
- any time you touch an animal

Likewise, wash your hands after changing a baby's diaper, helping someone clean themselves, or when cleaning a cut or wound.

FOOD HYGIENE AND SANITATION

Food hygiene is the conditions and measures necessary to ensure the safety of food from production to consumption. Food can become contaminated at any point during slaughtering or harvesting, processing, storage, distribution, transportation and preparation. Lack of adequate food hygiene can lead to foodborne diseases and death of the consumer. Food hygiene constitutes a basic necessity of Good Manufacturing/Agricultural Practices and the development of Hazard Analysis Critical Control Point (HACCP).The personal cleanliness and hygiene of food preparers are critical to protecting against foodborne illness. In addition to regular hand washing, some states require food preparers to wear latex gloves as an additional safeguard. Clean hair and clean clothing are essential. If a food preparer is dirty, the risk for food contamination increases greatly. Food sanitation and hygiene guidelines require food preparers to wear hats, hairnets and beard guards to make sure that hair doesn't contaminate food. Similarly, wearing aprons outside the food preparation area isn't permitted since bacteria are so easily carried back to the kitchen.

Food sanitation is essential aspect of food preparation. Food sanitation implies:

- Cleanliness
- Preparing
- Storing &
- Serving of food & water

Some items that need particular attention are:

- A safe and potable water supply
- Selection of wholesome ingredients &
- Hygienic handling

Water is essential in food preparation. Water is used to wash food before cooking. Clean the containers make beverage. It should be free from pathogenic bacteria. Water is potable if

- It is free from pathogenic bacteria
- It is free from harmful bacteria
- It contains dissolved salts or minerals

ENVIRONMENTAL SANITATION AND SAFETY

It is generally accepted that the assurance of food safety is primarily connected with the elimination of contamination in the full cycle of food production, from raw materials through manufacturing to finished products and kitchen operations. Among potential contaminants, primarily pesticides, heavy metals, and some biological contaminants have to be taken in consideration. The majority of these contaminants are of environmental origin. So it is understandable that a prerequisite of the production of safe food is the hindering of pollution in the environment. In this chapter some aspects of interrelations of food safety and environmental sanitation will be treated.

Integrated Pest Management and Food Safety

The last 40 years of the twentieth century saw a remarkable scientific revolution in agriculture, in which chemical technology played a major role. A broad range of chemicals is

now used in agriculture to reduce the losses caused by different pests. Pests—including insects, mites, pathogens (disease-causing microorganisms), weeds, nematodes, rodents, and others—contribute to high farm-producing costs and reduced quality and yields. Farm production losses to pests are estimated to exceed 35% annually. So it is understandable that reduction of these losses by using different chemicals is important from the point of view of increasing the effectiveness of agricultural production. The use of chemicals in agricultural production has provided numerous benefits in terms of increasing production and quality. However, as a result, consumers are exposed indirectly to chemicals, usually in minute quantities. Although the level of residues in food is low, they represent an additional health hazard for people consuming residue containing food. Because some types of these chemicals, such as organo-chlorine pesticides, heavy metals, and triazine herbicides, could not be degraded by naturally occurring soil microorganisms, the soil and water could also be polluted. In addition, it should be mentioned that because of transformation of pesticides in plants and soil, different metabolites are formed. Some of them may also be toxic.

For pesticides, less than 1% of all the wells surveyed had concentrations slightly above levels considered safe for human health, while about 1% of the community wells and about 2.4% of the private rural wells contained nitrate concentrations above the maximum contaminant level established to protect human health.

Any harmful health effects of pesticides are usually associated with the amount or dose of the pesticide. For example, a chemical worker who during manufacture of a pesticide harmful to humans accidentally comes into direct contact with large amounts of the pesticide could face serious injury. Yet, because the danger is so great, strict safety requirements have drastically reduced the likelihood of such an industrial accident occurring.

Integrated Pest Management (IPM) is an ecological approach to pest suppression. Establishment of an integrated pest suppression system should be based on thorough knowledge of:

- Crop and animal production methods
- Biology and ecology of each pest species and basic information on the genetics and physiology of pest species
- Relationships of the pests with the crop and other biological and physiological components of the ecosystem
- Potential economic damage of each pest and pest complex
- The issue of food safety and hygiene is a universal concern. This is because everyone has to consume food. This is a requirement for all people across the nation as well as the globe to be concerned about to be healthy and enjoy the food they must consume.

CHAPTER-15: FOOD ADULTERATION

***Learning Objectives*:**
After reading this chapter, the students will be able to:

1. Explain the terms food adulteration, and list the common adulterants
2. Demonstrate the common methods for testing adulterants at home,
3. List the various standards as set by FSSAI for food products.

INTRODUCTION

For good health, we must have good food. By good food, we mean nutritionally balanced, wholesome and safe food. Adulteration in food products is a part of under nutrition. Adulteration leads to loss of nutrients in food products and sometimes may prove very harmful for the body. Moreover, the consumer is cheated not only for his money by adulteration but also in quantity and quality as well.

Adulteration of food stuffs is commonly practised in India by the trade. The consumers like to get maximum quantity for a price as low as possible. The sellers must meet the needs of the buyers, to be able to exist. This is a vicious cycle. When the price of food production is higher than the price which the consumer is prepared to pay, seller is compelled to supply food product of inferior quality. Thus, adulteration occurs.

Food adulteration can be defined as the intentional addition or substitution or abstraction of substance which adversely affect the nature, substance and quality of food products. It can be at the time of harvesting, storage, processing, transportation or distribution.

TYPES OF ADULTERATION

Adulteration may be intentional or unintentional. The former is a wilful act on the part of the adulterator intended to increase the margin of profit. Incidental contamination is usually due to ignorance, negligence or lack of proper facilities.

A. **Intentional adulterants:** Intentional adulterants are sand, marble chips, stones mud, chalk powder, water, mineral oil and coaltar, dyes. These adulterants cause harmful effects on the body.

B. **Incidental adulterants:** Raw foods such as meat, fish, milk and vegetables grown on sewage are likely to be contaminated with harmful micro-organisms. These are generally destroyed during cooking or processing of food. Some of the micro-organisms may survive due to inadequate heat processing. Further, some of the foods, if consumed in the raw state, may cause food poisoning. Recent studies have shown that food grains legumes and oil seeds when stored in humid atmosphere are infected by pathogenic fungus which can cause serious illness.

To check the growing tendency of food adulteration, Government of India had introduced **"Prevention of Food Adulteration Act" (PFA)** in **1954**. This Act is based on international standards, keeping in mind the Indian conditions. This Act came into force on **June 1, 1955.**

FSSAI (FOOD SAFETY AND STANDARD AUTHORITY OF INDIA)

Figure 15.1: FSSAI symbol

In 2006, the **Food Safety and Standard Authority of India (FSSAI)** has been established under the food safety and standard Act, 2006 which consolidates various acts.

The Act has laid down science based standards for articles of food and regulates their manufacture, storage, distribution, and import to ensure availability of safe and wholesome food for human consumption and for matter and incidents connected therewith. The following foodstuffs should be deemed to be adulterated:-

1. If it is not of the nature, substance, and quality which it ought to be.
2. If it contains cheaper or inferior ingredients incidentally or intentionally.
3. If it has been prepared by a process which alters the nature, substance, or quality of foodstuff.
4. If any constituent has been abstracted partially or wholly from it like abstraction of cream from milk.
5. If it has been prepared, packed, or kept under unsanitary conditions.
6. If it is infected with insects, worms, etc.
7. If it is obtained from sick or diseased animal, e.g., milk and meat of diseased animals.
8. If it contains poisonous ingredients which are injurious to health.
9. If the container renders it poisonous or injurious to health.
10. If it contains unpermitted colours or any excessive amount of permitted ones.
11. If it contains prohibited preservatives or an excessive amount of permitted ones.
12. If it does not satisfy the prescribed standards laid down by the authorities even though they do not have adverse effect of health.

STANDARDS:

Standards framed by FSSAI are prescribed under Food Safety and Standards (Food Product Standards and Food Additives) Regulation, 2011, Food Safety and Standards (Packaging and Labelling) Regulation, 2011 and Food Safety and Standards (Contaminants, Toxins, and Residues) Regulations, 2011.

The FSSAI has prescribed standards for following food products:

- Dairy products and analogues
- Fats, oils and fat emulsions
- Fruits and vegetable products
- Cereal and cereal products
- Meat and meat products
- Fish and fish products
- Sweets & confectionery
- Sweetening agents including honey
- Salt, spices, condiments and related products
- Beverages, (other than dairy and fruits & vegetables based)
- Other food product and ingredients
- Proprietary food
- Irradiation of food

The development of standards is a dynamic process based on the latest developments in food science, food consumption pattern, new food products and additives, changes in the processing technology leading to changed specifications, advancements in food analytical methods, and identification of new risks or other regulatory options.

If a food product violates one or more of the above said standards, it will be regarded as an adulterated food and the seller will be punished under the law.

According to PFA Act, Food Adulteration includes:-

- ✓ Intentional addition, substitution or abstraction or substances which adversely affect the purity and quality of foods.
- ✓ Incidental contamination of foods with deleterious substances such as toxins and insecticides due to ignorance, negligence or lack of proper storage facilities.
- ✓ Contamination of the food with harmful insects, micro-organisms like bacteria, fungus, moulds, etc. during production, storage and handling.

Adulteration of food may endanger health if the physiological functions of the consumer are affected due to either addition or the removal of a vital component.

Adulterant is any material which is employed or which could be employed for the purpose of adulteration is defined as an adulterant.

TABLE 15.1: COMMON ADULTERANTS IN FOOD

FOOD ARTICLE	ADULTERANT	HARMFUL EFFECTS
Bengal gram dhal & thoor dhal	Kesai dhal	Lathyrism cancer
Tea	Used tea leaves processed and coloured	Liver disorder
Coffee powder	Tamarind seed, date seed powder	Diarrhoea
	Chicory powder	Stomach disorder, giddiness and joint pain
Milk	Unhygienic water & starch	Stomach disorder
Khoa	Starch & less fat content	Less - nutritive value
Wheat and other food grains (Bajra)	Ergot (a fungus containing poisonous substance)	Poisonous
Sugar	Chalk powder	Stomach – disorder
Black powder	Papaya seeds and light berries	Stomach, liver problems
Mustard powder	Argemone seeds	Epidemic dropsy & glaucoma
Edible oils	Argemone oil	Loss of eyesight, heart diseases, tumours
	Mineral oil	Damage to liver, carcinogenic effects
	Karanja oil	Heart problems, liver damage
	Castor oil	Stomach problem
Asafoetida	Foreign resins galbanum, colophony resin	Dysentery
Turmeric powder	Yellow aniline dyes	Carcinogenic
	Non-permitted colourants like metanil yellow	Highly carcinogenic
	Tapioca starch	Stomach disorder
Chilli powder	Brick powder, saw dust	Stomach problems
	Artificial colours	Cancer
Sweets, Juices, Jam	Non-permitted coaltar dye, (metanil yellow)	Metanil yellow is toxic and carcinogenic
Jaggery	Washing soda, chalkpowder	Vomiting, diarrhoea
Pulses (green peas and dhal)	coaltar dye	Stomach pain, ulcer
Suapari	colour and saccharin	Cancer
Honey	Molasses sugar (sugar plus water)	Stomach disorder
Carbonator water beverages	Aluminium leaves	Stomach disorder
Cloves	Cloves from which volatile oil has been extracted	Cheating, waste of money

ILL EFFECTS OF ADULTERANTS

In the earlier times, people used to prepare different eatables at home so that it is fresh, clean and healthy. But today everyone is so busy that they do not have time to cook food at home and rely on instantly made items. These have different kinds of preservatives that are used to keep them in good condition for a long time. But these are really harmful and have an adverse effect on our health. Today almost all the food items that you will get in the market have some or the other kind of adulterant which brings down the nutritional value and causes different types of health hazards. Let's know more about adulteration and how it is harmful to your health.

1. METANIL YELLOW

Metanil yellow is a food colorant used extensively in various foods. It is also used as an adulterant in different spices especially turmeric and regular Indian foods like pulses. Metanil yellow belongs to "non-permitted" category of food colour. Continued consumption of this toxic food color leads to adverse life-threatening effects in humans. Consumption of metanil yellow in food may affect our nervous system and may cause brain damage. Metanil yellow consumed through food enters our digestive system directly. Studies reveal that metanil yellow causes gastrotoxicity, hepatotoxicity, and damages the intestine.

2. ARGEMONE OIL

Consumption of adulterated mustard oil (Brassica nigra) with argemone oil (Argemone mexicana) even for a short duration leads to a clinical condition referred as epidemic dropsy. In humans, argemone oil contained in adulterated mustard oil causes oxidative stress and death of red blood cells via met-hemoglobin formation by altering pyridine nucleotide(s) and glutathione redox potential. Argemone oil contamination poses a serious threat to human health.

3. KESARI DAL

Excessive consumption of kesari dal produces Lathyrism (form of crippling, paralysis of both lower limbs) mainly in boys and men in the age group of 5 to 45 years. This disease manifests itself in 2-4 months if the diet consists of 40% or more of kesari dal.

- The disease starts with the stiffness of knee joints and legs, with pain around the knee and ankle joints.
- Within 10-30 days of the onset of symptoms, paralysis of the lower limbs sets in.
- The patient gradually becomes crippled as his knees are bent and stiff.

Table 15.2: Common Methods for Detecting Adulterants at Home

Food items	Brand tested	Rapid test	Result	Adulterant	Remark
Chilly powder	i)Standard ii)Substandard iii)Loose	Take 2 gm of the sample, in a test-tube, add few ml of solvent ether and shake. Decent ether layer in to a test-tube containing 2 ml of dilute HCl, shake it.	A pink to red colou red lower acid layer in chilly powder	i)Not found ii)Oil soluble coaltar dye iii)Not found	8.69 percent or the respondents used sub branded Apex chilly powder. This dyes are toxic and intake of excess could lead to abnormalities of eyes, bone, skin, lungs etc.
Turmeric powder	i)Standard ii)Substandard iii)Loose	Take 2 gm of turmeric powder in a test-tube. Add small quantity of water and few drops of concentrated HCl to it.	Appearance of bubble in a turmeric powder	i)Not found ii)Not found iii)Chalk powder	21 percent of the respondents used turmeric powder. Chalk powder not to be digest by human system and they can affect the normal digestion.
Coriander powder	i)Standard ii)Substandard iii)Loose	Take a teaspoonful of coriander in a glass of 100 ml of water	Inferior material float on the surface	i)Not found ii)Not found iii)Dung	21 percent of the respondents used loose coriander powder which may lead to tetanus
Asafoetida	i)Standard ii)Substandard iii)Loose i)Standard ii)Substandard iii)Loose	i)Shake little portion of the sample with water and allow to settle down at bottom. ii)Take a small quantity of sample in a test-tube, boil it, cool and add few drops of iodine solution	Impurities and resins will settle down of the bottom Appearance of blue colour.	i)Resin ii)Resin iii)Resin/starch i)Not found ii)Starch iii)Starch	16.67 percent and 15.38 percent of the respondents purchased loose and substandard brand that is Annapurana. Consumer pay excessive money for adding starch.
Salt	i)Tata ii)Nirmasuddh iii)Loose	Stir a spoonful of sample of salt in a glass of water	The solution become white and impurities settle down	i)Not found ii)Not found iii)Chalk powder	20 percent of the respondents purchased loose salt. It was adulterated with chalk powder and it cannot be digest by human. body and affect the normal digestion
Powdered sugar	i)Loose-1 ii)Loose-2 iii)Loose-3	Dissolve 10 gm of sample in a glass a water	The solution become white and impurities settle down	i)Chalk powder ii)Not found iii)Not found	41.67 percent of the respondents used loose powdered sugar. cHalk powder cannot digest by human body and affect the normal digestion

CHAPTER 16: READING AND UNDERSTANDING FOOD LABELS

***Learning Objectives*:**

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

1. Explain the term Food Label and its importance,
2. List the advantages and disadvantages of food labels.
3. Elaborate on the labelling provision in existing food laws.

A food label can be defined as a panel found on a package of food which contains a variety of information about the nutritional value of the food item. There are many pieces of information which are standard on most food labels, including serving size, number of calories, grams of fat, included nutrients, and a list of ingredients. This information helps people who are trying to restrict their intake of fat, sodium, sugar, or other ingredients, or those individuals who are trying to get enough of the healthy nutrients such as calcium or Vitamin C.

Food label is any tag, brand, mark, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed or impressed on, or attached to, a container of food. Food labelling includes any written, printed or graphic matter that is present on the label, accompanies the food, or is displayed near the food, including that for the purpose of promoting its sale or disposal. The label may either be engraved or attached on to the packaging of the product.

Nutrition Facts

Serving Size 2/3 cup (55g)
Servings Per Container About 8

Amount Per Serving

Calories 230	Calories from Fat 72
	% Daily Value*
Total Fat 8g	**12%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**12%**
Dietary Fiber 4g	**16%**
Sugars 1g	
Protein 3g	
Vitamin A	10%
Vitamin C	8%
Calcium	20%
Iron	45%

* Percent Daily Values are based on a 2,000 calorie diet. Your daily value may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Nutrition Facts

8 servings per container
Serving size **2/3 cup (55g)**

Amount per serving
Calories **230**

	% Daily Value*
Total Fat 8g	**10%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Cholesterol 0mg	**0%**
Sodium 160mg	**7%**
Total Carbohydrate 37g	**13%**
Dietary Fiber 4g	**14%**
Total Sugars 12g	
Includes 10g Added Sugars	**20%**
Protein 3g	
Vitamin D 2mcg	10%
Calcium 260mg	20%
Iron 8mg	45%
Potassium 235mg	6%

* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

Figure 16.1: Nutrition Facts

A food label must have the following: -

- Name of the product.
- Brand name
- Trademark
- Manufacture's name and address.
- Name of the country in which the product is made.
- Ingredients
- Net weight/ volume/ length
- Use of the product
- Maximum retail price (inclusive of all the taxes)
- Warning and precautions
- Directions for use
- Standard mark
- Date of manufacture
- Date of best before
- Batch/lot number
- Details of colour or added preservatives

Figure 16.2: Label

ADVANTAGES OF A FOOD LABEL

- Labels assist a consumer in making a wise decision.
- The label provides detailed information about a food's nutrient content.
- You can use the label compare two similar foods to decide what would be the healthier choice.
- The list of ingredients is essential in case a person is allergic to some ingredient.
- They also help to see the quality of the product through the given standardised marks.
- The rates and the amounts can be checked and compared.
- In case of any defect the manufacturer can be contacted directly through the address given.
- A consumer can refer the label as and when required.
- Any special scheme offered by the manufacturer is also mentioned on the label.
- Labels guide the consumers how to store and use the products.

LIMITATIONS OF A FOOD LABEL.

- Labels may not give complete information.
- The print may be blurred, small or overlapping.
- Labels of popular brands may be initiated in case of sub-standard products.

HOW TO READ A FOOD LABEL

Most foods in the grocery store have a nutrition facts label and list of ingredients. When you go for grocery shopping, take the time to read the nutrition facts labels on the foods you purchase. Compare nutrients and calories in one food to those in another. The information may surprise you. Make sure you are not buying foods high in calories, saturated and trans fats, sodium and added sugars.

INFORMATION OF THE NUTRITION FACTS PROVIDED BY LABEL

- **Serving Size** — This is how much of the food is considered a "serving". A package may contain multiple servings. If you eat more or less than the serving size listed, you need to adjust the amount of nutrients and calories you are eating.
- **Calories** — This tells you how much energy is in the food. It is helpful to know if you are cutting calories to lose weight or want to manage your weight.
- **Total Fat** — This is the amount of fat found in one serving of the food. It includes the amount of "bad fats" (saturated and trans fats) and "better fats" (monounsaturated and polyunsaturated fats). Fat is higher in calories than protein or carbohydrates. So, cutting back on your fat intake will help you reduce the amount of calories you eat.
- **Saturated Fat** — Eating too much of these "bad fats" can raise your cholesterol and your risk of heart disease and stroke. Limit your saturated fat intake to less than 5 to 6 percent of your total calories. For a person who needs 2,000 calories a day, this is about 11 to 13 grams of saturated fat.
- **Trans Fat** – These fats are also considered "bad fats" because they can raise LDL (LOW DENSITY LIPOPROTEIN) cholesterol and risk of heart disease. Choose foods

with “0” grams of trans fat and read the ingredients list to avoid foods made with “hydrogenated oils”. Everyone can benefit by limiting trans fats.

- **Cholesterol** — The FDA’s Dietary Guidelines for Americans recommend eating less than 300 mg of cholesterol a day to maintain normal cholesterol levels. They also recommend consuming less than 200 mg per day if you are at high risk for (or have) heart disease.
- **Sodium** — Watch for both naturally-occurring and added sodium in food products. Salt is sodium chloride. Most people should take in less than 1,500 mg of sodium each day. That’s equal to a little more than ½ tsp. of salt.
- **Total Carbohydrates** — A carbohydrate is a type of sugar. Carbohydrates in food are digested and converted into glucose, or sugar, to provide the cells of the body with energy. Choose carbohydrate-based foods with high amounts of nutrients. These include vegetables, fruits and whole-grain, breads, cereals and pasta.
- **Dietary Fibre** — Dietary fibre describes several materials that make up the parts of plants your body can’t digest. As part of a healthy diet, soluble fibre can help decrease your risk of heart disease and some types of cancer. Whole grains and fruits and vegetables include dietary fibre. Most refined (processed) grains contain little fibre.
- **Sugar** — The amount listed includes both sugars that occur naturally in foods, such as fruit and milk, and sugars that are added to foods, such as soft drinks and other sweetened foods and beverages. There are lots of different names for “added sugars” such as sucrose, fructose, glucose, maltose, dextrose, high-fructose corn syrup, corn syrup, concentrated fruit juice, and honey. Look at the ingredients list and make sure that there aren’t a lot of “added sugars” listed in the
- **Protein** — This is one of the components in food that provide us with energy. Animal protein contains saturated fat. Choose fish and skinless poultry and limit your intake of red meat. Use low-fat dairy products. Try other sources of protein such as beans, nuts, seeds, tofu and other soy-based products.
- **Vitamins and Minerals** — Vitamins and minerals are important parts of your diet. Eating a variety of foods will help you reach your daily goal of 100 percent of vitamin A, vitamin C, calcium and iron.
- **Daily Value** — The standard daily values are guides for people who eat 2,000 calories each day. If you eat more or less than that, your daily value may be higher or lower.

IMPORTANCE OF A FOOD LABEL.

Ensuring food safety is a shared responsibility between governments, producers, industry and consumers. Food labelling is one way in which consumers can get knowledge about the food they consider buying. Correctly following the information provided on food labels (such as expiry dates, handling instructions and allergy warnings) can help consumers prevent unnecessary food-borne illness and allergic reactions.

Reading food labels will make it much easier for you to compare foods and find the foods that have the nutritional value your child needs. It will help you and your family make healthy choices about the foods you are buying.

Food labels can help you limit the amount of fat, sugar and cholesterol in your diet by making it easy for you to compare one food item with another and choose the one with lower

amounts. Conversely, you can use food labels to find food items higher in vitamins, fibre and protein.

The nutritional information found on a food label is based on one serving of that particular food. That is one of the most common mistakes people make when reading food labels. A food label may indicate that a food has 100 calories and only 5 grams of sugar, for example. But if you look at the number of servings, it may state three. That means that if you were to eat the entire package, you would be getting three times the amount shown on the food label. In this example, 300 calories and 15 grams of sugar. Don't be fooled, always look at what makes one serving (which the food label information is based on) and how many servings in that package

STANDARD/CERTIFICATION MARK

This is a mark given to a product which meets certain standards with respect to the quality of the product in terms of:

- Material used
- Method of manufacturing
- Packing
- Sale
- Performance

The standard mark indicates that a product has been produced in accordance with the norms laid down by the standardising agency. Standard marks also encourage manufacturers to provide better competition in the market and also upgrade the quality of their products.

STANDARD MARKS WITH REFERENCE TO FOOD PRODUCTS

A. ISI MARK

- It is a certification mark given by the Bureau of Indian Standards (BIS). INDIAN STANDARD INSTITUITION (ISI) prescribes standards for product specification, methods of testing, etc.
- It develops consciousness among manufacturers and encourages them to produce quality products.
- It gives the manufacturers licences to use the ISI mark. This is given only after ensuring that the manufacturer is capable of producing the products as per the requirement on the continuous basis.

- The quality is maintained right from the raw material through the process to the finished product. This ensures that the finished product is in the conformity to the laid down standards.
- It also publishes many informative pamphlets and booklets on standards relating to many products.
- ISI mar is given to – custard powder, common salt, baking powder, cocoa, milk powder, condensed milk, wafers, coffee, ice cream, chewing gum, drinking chocolate, mineral water, etc.

B.AGMARK

- This was set up by Directorate of Marketing and Inspection of Government of India. It establishes norms for agricultural and livestock product at natural and processed stages.
- It categorises commodities into various grades depending on the degree of purity. These grades re 1,2,3,4 or extra-large, large, medium, small, etc.
- These standards also specify the type of packing to be used for different products for example special egg trays, milk polybags, oil bags or cartons.
- AG MARK is given to: Ghee, butter, oil, wheat flour, rice, powdered sugar, spices, eggs, fruits, etc.

B. FPO (FRUIT PRODUCT ORDER)

C.

- It lays minimum standards relating to the quality of various preserved foods made from fruits and vegetables.
- It lays standard of hygiene and sanitation.
- It lays minimum standards that must be maintained throughout the farming, manufacturing, processing and retailing of the product.
- It also gives instructions for packaging, labelling and temperatures of food containers.
- FPO is given to- pickles, jams, jellies, ketchup, frozen and canned food.

NUTRITION LABELLING

The food industry contributes to nutrition education by offering products that correspond to the current needs of the consumer and by informing them about product ingredients and nutritional characteristics. Nutrition labelling refers to the standardised presentation of nutrient content of the food.

Generally, the claims fall into some broad categories

- **NUTRITION CLAIMS-** They can be categorised as representations which state, suggest or imply that a food has particular nutritional properties including energy value, content of protein, fat, carbohydrates, vitamins and minerals. List of ingredients and mandatory declaration cannot be treated as a nutrition claim.

- **NUTRIENT CONTENT CLAIM**- This is a nutrition claim that describes the level of a nutrient contained in a food for example- low in fat, rich in iron or low sodium.

- **COMPARITIVE CLAIM**- It is a claim that compares nutrient levels or energy value of two or more foods. The foods being compared should be different versions of same

food or similar food. The difference in nutrient content and energy value should be given.

- **NUTRIENT FUNCTION CLAIM**- This is a claim that describes the physiological role of a nutrient in the growth, development and normal function of the body e.g. contains calcium for stronger teeth.

GUIDING PRINCIPLES OF NUTRITION LABELLING

- To make nutrition labelling useful, available and accessible to consumers. At the same time, they should be clear, simple, accurate, practical, readable, informative, consistent and legible.
- The serving size should be realistic.

LABELLING PROVISIONS IN EXISTING FOOD LAWS

THE FOOD SAFETY AND STANDARDS ACT, 2006

Under this Act every package of food shall carry a label giving the following information:

- The name, trade name or description of food contained in the package.
- The name of ingredients used in the product in descending order of their composition by weight or by volume as the case maybe.
- In case, both colour and flavours are used in the product, the label should mention.
- If gelatin is used as an ingredient, a declaration should be made using the words "gelatin animal origin".
- A label should not contain any statement, claim, design, device, fancy name or abbreviation which is false or misleading in any particular way.
- The Act also makes it mandatory that labels should not use words implying recommendations by medical profession.
- The package, label or advertisements of edible oils and fats should not use expressions like 'super- refined', 'extra- refined', 'double-refined', 'anti-cholesterol', 'smoothening to heart', etc.

COMPULSORY BEST BEFORE DATE

Government has made it mandatory with effect from July 1999 that all packed food items should necessarily display **BEST BEFORE DATE**.

It has been made mandatory that every container of milk substitute or infant food shall indicate in a clear conspicuous and easily readable manner an important notice which reads, 'MOTHER'S MILK IS BEST FOR BABIES' in capitals.

LABELLING GENETICALLY MODIFIED FOODS

In Indian context in November 2000, the Ministry of Agriculture announced that genetically engineered seeds and food would not be allowed in the country until their safety was scientifically proved.

MARKETING THE 'ANIMAL ORIGIN' FOOD

From October 2001, it has become mandatory for all foods containing ingredients of animal origin to sport a brown dot encased in a brown box. As of now, milk and milk products if they are used as an ingredient are exempted from this order.

CHAPTER 17: HFSS FOODS AND THEIR IMPLICATIONS

Learning objectives:

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

1. Understand the concerns associated with the consumption of HFSS foods.
2. Highlight the risk factors of HFSS foods in children's
3. List the steps to enhance availability of wholesome and nutritious food among children.

[WU1]

As per "Dietary Guidelines for Indians, 2011" by National Institute of Nutrition (NIN), a balanced diet is one which provides all nutrients in required amounts and proper proportions. It should provide around 50-60% of total calories from carbohydrates, preferably from complex carbohydrates, about 10-15% from proteins and 20-30% from both visible and invisible fat. In addition, it should provide other non-nutrients such as dietary fibre, antioxidants, which bestow positive health benefits.

The guidelines depict the importance of foods through a "Food Pyramid" (Figure 17.1). Balanced diet is recommended through a blend of four basic food groups such as cereals, millets and pulses; vegetables and fruits; oils, fats and nuts; milk and animal foods. Notably, food items such as burgers, pizzas, fries, chocolates, ice creams, jams etc. are not considered the right choice to meet nutrient needs and must be eaten sparingly.

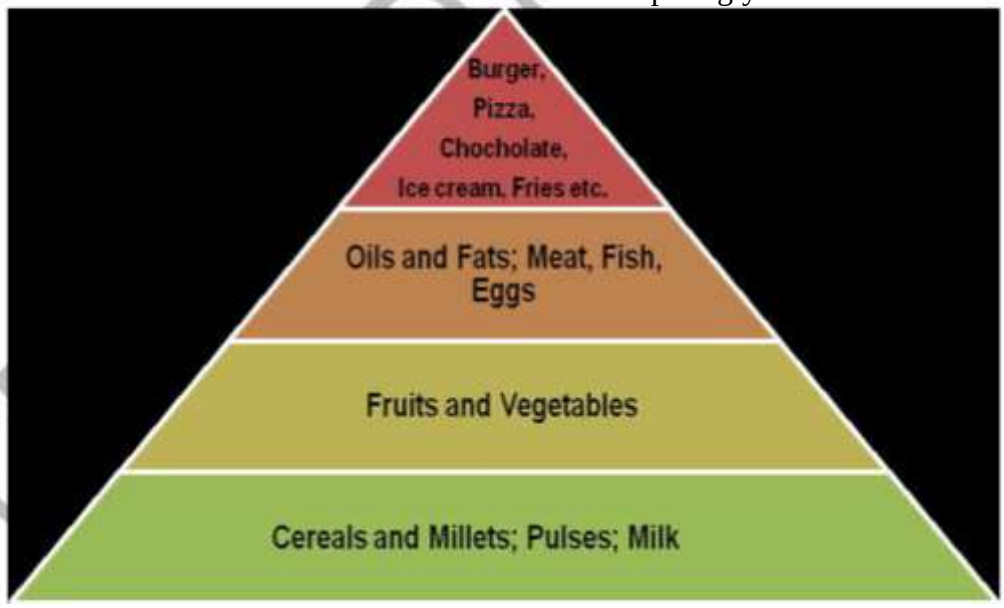

Figure 17.1 Food Pyramid

HFSS Foods' and ingredients of concern

As per WHO Document titled "Marketing of Foods High in Fat, Salt and Sugar to Children – Update 2012-2013", foods that are high in fat, salt and sugar are commonly termed as HFSS Foods.

Sugar: Sugar is empty calories with no beneficial effect and there is no safe level of its intake. High use of sugar, particularly fructose, is harmful. Studies have established direct relationship
of sugar with obesity, diabetes and metabolic syndrome.
Salt: Salt is added for preservation and enhancing the taste of food. High salt content in diet is strongly associated with high blood pressure and related cardiovascular diseases. Evidence suggests that high salt intake increases mass of left ventricle, stiffens and narrows arteries, including coronary and renal arteries. It increases the probability of stroke, severity of cardiac failure and tendency for platelets to aggregate**.** As per WHO, cutting down on dietary salt intake
to recommended 5 g per day has a major impact on reducing blood pressure and cardiovascular
diseases.

Saturated Fatty Acid (SFA): SFAs are widely used in packaged foods including cookies, crackers, and snack chips. When consumed in excess of the recommended (limit less than 10% of total calorie intake), SFAs are known to clog arteries and increase risk of heart attack and stroke.

Trans Fatty Acid (TFA): TFAs are formed during the process of hydrogenation of vegetable oils (PHVOs) to make it semi solid that enables longer shelf life, better form and texture. Typically they are found to be high in bakery products and snacks that are deep-fried in PHVOs.

TFAs are well known to have an adverse impact on blood lipid levels as they reduce the amount
of good cholesterol (HDL) and increase bad cholesterol (LDL). Their consumption increases insulin resistance and promotes obesity. WHO recommends less than 1% of calories from TFAs.

Besides the above key ingredients of concern, caffeine used in carbonated beverages and energy drinks is an addictive stimulant, which, if consumed in excess, can lead to impaired muscle and nerve functions, dehydration and a host of other disorders9. Consumption of caffeine, particularly among school children, is a matter of concern and needs to be strictly regulated in compliance with the Food Safety and Standards Act, 2006 and Regulations made there under.

Unhealthy diet leads to metabolic changes and conditions such as overweight, high blood pressure, raised blood glucose and cholesterol, which are among the leading causes of NCD deaths in India.

Childhood obesity

Childhood obesity is one of the most serious public health challenges of the 21st century. Overweight children are likely to become obese adults. As per WHO, about 44% of the diabetes
burden and 23% of the CVD burden is attributable to overweight and obesity. Overweight children are more likely than non-overweight children to develop insulin resistance, hyperinsulinemia, diabetes and cardiovascular diseases at a younger age, which in turn are associated with a higher chance of premature death and disability.

Studies have established the link between consumption of HFSS food and obesity. Numerous studies done among school children of Delhi, Amritsar, and Southern India show that the prevalence of overweight/obesity is high and on the rise. In urban post-pubertal children of Delhi, it increased from 16% in 2002 to about 24% in 2006. It is high among the affluent class and children of private schools compared to low and middle-income groups.

Hypertension

In India, hypertension is the leading NCD risk and estimated to be attributable for over 10 per cent of all deaths. Hypertension is strongly associated with high Body Mass Index (BMI) and salt intake. As per WHO, the amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk. World Heart Federation says that a universal reduction in dietary intake of about 3 gm. of salt, would lead to a 50% reduction in the number of people needing treatment for hypertension. The same decrease would lead to a 22% drop in the number of deaths resulting from strokes and a 16% fall in the number of deaths from coronary heart disease.

Diabetes and pediatric metabolic syndrome

Type 2 diabetes which is very common in adults is now increasingly being reported in children.
The leading risk factor for kids is being overweight, often connected with an unhealthy diet and lack of physical activity. Metabolic syndrome is a cluster of the risk factors for type-2 diabetes and cardiovascular disease characterized by abdominal obesity and others such as high blood pressure and increased plasma glucose.

Coronary Heart Disease (CHD)
CHD affects Indians with greater frequency and at a younger age than counter parts

HFSS food consumption in India
Consumption of 'HFSS Food' is steeply increasing both in urban and rural areas. The ease of availability, taste, low cost, aggressive marketing and advertisements and peer pressure make them popular with children.

HFSS food replacing balanced diet is a key issue: As per NIN dietary guidelines "the shift from traditional to 'modern' foods, changing cooking practices, increased intake intensive promotion of HFSS foods and beverages have affected people's perception of foods as well as their dietary behavior. Irrational preference for energy-dense foods and those with high sugar and salt content pose a serious health risk to the people, especially children. The increasing number of overweight and obese people in the community and the resulting burden of chronic noncommunicable diseases necessitate systematic nutrition educational interventions on a massive scale."

Additionally, a lot is at stake if balanced diet is replaced: A diverse range of macronutrients and micronutrients in its most natural form; Original flavors, colors and aroma that continue to
keep the appetite alive for a lifetime; A wide range of time tested spices and herbs that continue
to act at a prophylactic level (preventive) at sub-therapeutic levels.

PREVENTIVE MEASURES

Several countries have taken steps to enhance availability of wholesome and nutritious food to school children and to restrict/limit availability of HFSS Foods among them. With respect to India, the proposed guidelines are based on following principles:

i) **Children are not the best judge of their food choice.** They have limited understanding on the impact of food on their health. Broadly, they are not aware about the concept of balanced diet and what kind of food is to be consumed and avoided to achieve it. They also lack required know-how on diseases and its relation to diet. While on one hand, they lack awareness and necessary discretion, such products are being promoted by manufacturers. They are one of the biggest viewer groups of television and food advertisements constitute a major share of overall TV, radio and print advertisements across the world.

ii) **Schools are not the right place for promoting HFSS foods.** Schools are a place to learn right values and constructive behaviors for a lifetime. Since food consumption at school is significant part of the overall daily diet, schools should not allow the canteens to promote food habits that negatively impact the health of children.

iii) **Benefits of balanced, fresh and traditional food cannot be replaced.** Frequent consumption of foods high in salt, sugar and fats and low in other essential macro and micronutrients is detrimental and should best be avoided. Such eating behaviors may extend beyond schools and become a dietary habit.

iv) **It is necessary to improve the dietary habits** of school children by providing and appropriate mix of foods that enhances the wholesomeness and nutrition and also encourages them avoid consumption of unhealthy diet.

v) **Physical activity** is another important element of promoting growth and help in reducing the risks and incidence of non-communicable diseases.
