
UNIT 4 DIETARY MANAGEMENT IN DISEASE – I

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4.0 OBJECTIVES

After studying this unit, you should be able to:

- discuss the general principles in dietary management;
- describe diet therapy in nutritional deficiency disorders; and
- explain the principles and practice of dietary management in diseases related to the following body systems: gastrointestinal, cardiovascular, urinary and musculoskeletal systems.

4.1 INTRODUCTION

Disease is usually associated with changes in body structure and/or function. Such changes are part of the disease process and result from specific abnormalities in the way the body handles substances. As you are probably aware, infections often initiate the disease process.

In this and in the next unit, we will take a close look at the ways in which we can use the diet as a therapeutic tool. In certain diseases dietary measures can result in a complete cure while in others the diet checks the disease and prevents further complications to arise. You will clearly see this distinction emerge as you read through Units 4 and 5.

While studying dietary management look carefully at the problems associated with each disease. Then concentrate on how these problems can be overcome or at least controlled by using the correct diet therapy.

In this unit we will be looking at the dietary management of nutritional deficiency disorders and diseases related to various body systems. To help you place things in perspective, an overview has been given at the beginning of the unit.

4.2 DIETARY MANAGEMENT IN DISEASE—AN OVERVIEW

We have used the phrase “dietary management” several times during our discussion so far. What does this phrase mean? It refers to managing a disease condition using dietary means. Dietary management focusses on practical aspects of normal diets, application of which principles and adaptation or modification of these diets to the disease condition.

In Unit 2 we talked about the ways in which the normal diet may be modified. Can you list them here?

We also mentioned that normal diets are adopted for therapeutic purposes which are adapted/modified and are called adapted or modified therapeutic diets. They are also known as **therapeutic diets** and are planned to:

- maintain good nutrition/health status
- correct deficiencies that may have occurred
- give rest to the body or any specific organ
- meet the requirements of specific conditions.

It is important to stress that therapeutic diets do have to be specially prepared for each patient. **Individualized care** must be the focus of therapy. In fact the doctor, nurse and dietitian should work as a team to provide the best possible health nutrition care as Fig. 4.1 illustrates.

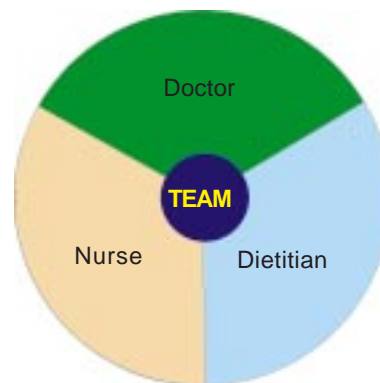


Fig. 4.1: Health and nutrition care team

The task of the team is not only to treat the patient’s condition but also to help him or her to understand the disease and cope with it. That, in essence, is the success of therapy. You, as a nurse, have a crucial role to play. There would be several situations where you need to explain the reasons for a diet to a reluctant or even hostile patient. You have to win the patients’ cooperation. The nurse must often answer questions related to selection of foods, allowed or permitted foods, how to prepare foods and when they should be served. She would have to create a conducive environment for the patient’s meals. Special care could be taken to provide the meals attractively. Also she may have to assist some patients in eating. It is often she who would translate the doctor’s orders and anticipate the patient’s reactions.

We will be discussing dietary management of disease in this unit and in the next. Here we will concentrate on the dietary management of the following diseases/disorders:

- Nutritional deficiency disorders
- Diseases of the gastrointestinal tract
- Liver, gallbladder and pancreatic disorders
- Cardiovascular diseases
- Diseases of the urinary tract system and
- Musculoskeletal disorders.

Let us first turn our attention to diets in nutritional deficiency disorders.

4.3 DIET THERAPY IN NUTRITIONAL DEFICIENCY DISORDERS

Diet plays a central role in treatment of nutritional deficiency disorders. Food itself does not contain nutrients in high enough concentrations and so nutrition support may be given by administering concentrated preparations of nutrients orally, intravenously or intramuscularly. In addition, underlying causes of deficiency— such as hookworm infestation or an infection—must be treated, otherwise it cannot be cured. A checklist of signs and symptoms of nutritional deficiency disorders was given in Unit 3. We will summarize these again to help you remember.

We begin with PEM or protein energy malnutrition.

a) PEM

PEM is now understood to be a spectrum of conditions as depicted here:

Marasmus	Marasmic	Kwashiorkor
	Kwashiorkor	

Marasmus and kwashiorkor are both extreme serious forms of PEM. However, most cases fall into the category called “marasmic kwashiorkor” showing signs of both.

Table 4.1 summarizes the major clinical features of PEM and the essentials of treatment.

Table 4.1: PEM — Symptoms and Treatment

Deficiency	Symptoms	Treatment
PEM	Growth failure	Enteral feeding using high calorie Preparation in severe cases
	Oedema	High energy and protein diet in moderate and mild cases. Sodium restriction
	Peeling off skin and discolouration	Vitamin and Mineral supplements
	Change in hair colour, hair thinning and easy pluckability	Treatment of underlying or associated disorders e.g. deficiencies, Diarrhoea, infections, infestations

Severe PEM is often associated with dehydration and infection as we mentioned earlier. These are life threatening and have to be tackled immediately. If the patient can take fluids orally, ORS solution is administered. **ORS solution consists of the following salts dissolved in one litre of clean, boiled and cooled drinking water : Sodium chloride 3.5 g, sodium bicarbonate 2.5 g, potassium chloride 1.5 g and glucose 20.0 g.** Between 50 and 100 ml of ORS solution per kg body weight, depending on whether the dehydration is mild or moderate, usually restores normal hydration. This amount should be given in the first 4-6 hours of treatment, in small quantities every few minutes.

If the signs of dehydration disappear, maintenance therapy with ORS solution begins and is continued till the diarrhoea stops. For mild diarrhoea, 100 ml/kg body weight of ORS per day is adequate. In the case of severe diarrhoea, 2-4 times this amount may be needed. During maintenance therapy other fluids in addition to ORS can be given.

Within 8-12 hours full rehydration should be achieved. By this time, half strength milk preparations (i.e. half the strength normally taken by the infant) can be started for children and adults. Water should be available throughout therapy with ORS solution.

- i) Water with ORS solution
- ii) Water as well as ORS solution

What should be done in the case of children who vomit constantly? Or suppose the child cannot be fed orally? In such cases nasogastric feeding is tried. The volume of fluid to be given by nasogastric tube is 120 ml/kg body weight for the first 6 hours, divided into 12 portions. One portion is, of course, given every half hour.

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But what if this also fails? In such cases of severe dehydration, intravenous fluid is the only answer to correct the dehydration. 70 ml/kg body weight of fluid is administered during the first three hours of treatment, i.e. 30 ml in the first hour of treatment, and the rest over the next two hours. The fluid administered is **Ringer's lactate** with the following composition:

Lactic acid	2.4 ml sodium hydroxide
Sodium hydroxide	as needed to adjust pH
Sodium chloride	6.0 g
Potassium chloride	0.4 g
Water	as needed to adjust volume to 1000 ml.

After the first three hours, intravenous therapy is continued only if ORS solution cannot be accepted by mouth or if signs of dehydration remain.

Let us assume at this point that we have successfully corrected the dehydration and that diarrhoea and vomiting have stopped. We can then follow this typical feeding schedule given in Table 4.2.

Table 4.2 : Feeding Schedule for PEM Child

Days	Type of feed	Number of feeds per day
	Half strength milk feed, (if there is no diarrhoea, vomiting or dehydration)	
Day 1	Half strength milk feeds (if there is no diarrhoea, vomiting or dehydration)	12
Day 2	Half strength milk	12
Day 3	- do -	8
Day 4, 5	Full strength milk feeds	8
Day 6 onwards	High energy milk feeds	6

Source : Adopted from Table 3 in "The Treatment and Management of Severe Protein Energy Malnutrition", WHO, Geneva, 1981.

The table clearly indicates how oral feeding can be started with small frequent feeds of dilute milk in the case of patients who are not dehydrated or in whom dehydration has been corrected. Why do you think this is done? The answer obviously is that such feeds would provide some energy and protein. Also, since they are dilute they would not provoke either vomiting or diarrhoea. Look at the table again. Do you also notice the fact that **the strength and volume of feeds is gradually increased, while frequency of feeding is decreased?**

As soon as the patient is able to tolerate milk feeds well, there is the need to switch to high energy feeds usually based on milk. Why? You are aware that growth failure is associated with PEM. Since the major problem is a shortage of energy and also protein, the feeds must provide these nutrients in sufficient amounts. When the child is given these milk feeds of high energy content, the growth rate is astonishing, as the child seeks to catch up. This is, in fact, called catch up growth.

However, it is commonly observed that during the first week or so of high energy feeding, malnourished patients may not gain weight. This is due to the body taking time to adjust. Body composition itself alters in response. Such a situation is nothing to worry about.

Table 4.3 gives you some details about high energy feeds. High energy feeds and diets have traditionally been based on milk, sugar and oil. However, cereal and pulse combinations have been used in the preparation of high energy feeds in our country.

Let us first look at some milk-based preparations suggested by WHO.

Table 4.3: High Energy Feeds

	Ingredients amount or quantity		
	Milk or Milk preparation	Oil	Sugar
Cow's milk	900	55	70
Buffalo's milk	800	30	65
Skimmed milk powder	90	85	65
Evaporated milk	450	50	70
K-Mix 2 (unreconstituted)	120	85	35

Notes : i) The milk/milk powder is mixed with oils to be used and sugar and reconstituted with water so that total volume is 1000 ml.

ii) K-Mix 2 is a food mixture produced for and distributed by UNICEF for initiation of treatment of severe PEM.

Source : The Treatment and Management of Severe Protein Energy Malnutrition, WHO, Geneva, 1981.

Composition of K-Mix 2 is as follows : Calcium caseinate 3 parts by weight; skimmed milk powder 5 parts by weight; sucrose 10 parts by weight and a vitamin A preparation, retinal palmitate 2.75 mg (5000 IU vitamin A) per 100 g dry mixture.

Activity 1

Find out the high energy preparations used for treatment of severe PEM in the hospital or clinic where you work. Note the ingredients and their amounts as well as methods of preparation.

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We have so far discussed how important dietary supplements can be in treating cases of PEM. Gradually the child returns to the customary diet. However, care has to be taken that a nutritious diet rich in energy and protein as well as vitamin and mineral sources should be given as a routine.

Now, how do we know a child has fully recovered? A child can be considered fully recovered and ready for discharge when he reaches the normal weight for his height or length (in the case of infants).

Regular follow-up of children who have recovered from severe PEM is strongly recommended since this:

- reduces the risk of the child from getting PEM again;
- allows completion of immunization schedules;
- provides an opportunity for continuing education of the parent on child feeding and child rearing practices, family planning and personal hygiene.

These are guidelines laid down by WHO.

It is also recommended that every child admitted for treatment of severe PEM should be followed up regularly until 2-5 years of age, or in the case of older children for a minimum period of one year.

b) Anaemia

Nutritional anaemia is caused mainly due to deficiency of:

- Iron or
- Vitamin B₁₂ and/or folic acid

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As you are aware, anaemia is characterized by a lowering of blood haemoglobin level below normal. WHO has suggested the following cut off points for anaemia (See Table 4.4).

Table 4.4: Haemoglobin Cut Off Points for Anaemia

Age/Sex groups	Haemoglobin level (g/dl)
Children 6 months-5 years	<11
Children 6-14 years	<12
Adult males	<13
Adult females (non-pregnant)	<12
Adult females (pregnant)	<11

Source : WHO Technical Report series No. 405, 1968.

Table 4.5 discusses the treatment of iron deficiency anaemic (microcytic anemia) and folic acid/B₁₂ deficiency related anaemia (megaloblastic anaemia). Look up Annexure 2 (Nutrient Sources) in the Practical Manual for iron-rich food sources. Encourage the anaemic patients to include these iron rich food sources in their diet.

Table 4.5: Treatment of Anaemia

Types of anaemia	Treatment
Iron deficiency anaemia	<p>In severe cases</p> <ul style="list-style-type: none"> ● Adults and children weighing over 20 kg: 200 mg ferrous sulphate two times a day ● Smaller children: 30 mg/kg of body weight/day, given in three doses, as a freshly prepared ferrous sulphate solution <p>In mild cases</p> <ul style="list-style-type: none"> ● For adolescents and adults: 200 mg ferrous sulphate per day; response in terms of haemoglobin concentration is almost complete after two months but iron therapy should continue for another two to three months to build up iron stores to about 250-300 mg. ● For pregnant women with anaemia daily administration of 500 folate with 120 mg iron (equivalent to 400 mg ferrous sulphate) is beneficial. This would mean taking two combination tablets/day, each containing 250 mg folate and 60 mg iron. <p>For iron deficiency anaemia give liver, green leafy vegetable, cereals with added iron, chirwa, water melon, peas, beans and lentils, whole grain cereals.</p>
Megaloblastic anaemia	<p>Folic acid deficiency :</p> <p>1 mg tablet of folic acid three times a week or more, according to need</p> <p>For folic acid deficiency eat dry beans, peas and peanuts, orange, orange juice, dark green leafy vegetables.</p> <p>Vitamin b₁₂ deficiency</p> <p>100 mg cobalamin, intramuscularly, twice a week. If the spinal cord is affected, daily treatment with the same dose for a week; and three times a week after that. Maintenance therapy with injections of 100 ug every two weeks will maintain blood count and restore B₁₂ levels in blood to normal.</p> <p>Patients who cannot absorb vitamin B₁₂ due to lack of a gastric factor called intrinsic factor, suffer from pernicious anaemia. These patients have to be given B₁₂ intravenously, or large oral doses, i.e. B₁₂ 1000 ug weekly.</p> <p>B₁₂ is mostly in meat and meat products. Some intestinal bacteria also produce.</p>

To control anaemia, control of associated infestations/infections is important. So control of hookworm, trichiuris, malaria has to be undertaken wherever necessary.

c) **Vitamin A Deficiency (Xerophthalmia)**1) **Emergencies**

Children with active corneal signs (corneal xerosis, corneal ulceration/keratomalacia), and severely ill or malnourished children with any sign of xerophthalmia coming from a community where xerophthalmia occurs.

Outpatients: Give immediately to children over 1 year — 200,000 I.U. in oil (given orally) or water miscible (given intramuscularly). Infants — half the dose for children over 1 year, re-examine the child after one week.

Inpatients: Immediately 100,000 I.U. water miscible given intramuscularly to all children; 2nd day 100,000 I.U. oil solution given orally to children over 1 year. On discharge : give 200,000 I.U. oil solution orally to children over 1 year, and 100,000 I.U oil solution orally to infants.

2) **Non-urgent Cases**

- a) For children with non-corneal signs of xerophthalmia (night blindness, conjunctival xerosis) or no severe illness but from a community where xerophthalmia occurs: 200,000 I.U. oil solution is given orally to children over 5 years; 100,000 I.U oil solution is given orally to infants. The dose can be repeated every 6 months.
- b) For mothers who have just delivered babies, who plan to breast feed, or pregnant women from a community where xerophthalmia occurs : 300,000 I.U oil solution : orally, in a single dose.

Encourage the children and mother to include Vitamin A rich foods in their diets. A list of Vitamin A rich foods is included in Annexure 2 in the Practical Manual. Read it carefully for detail. But do not forget that milk, eggs, butter, papaya, carrots and green leafy vegetables are rich in this vitamin.

d) **Other Vitamin Deficiencies**

Table 4.6 indicates the management and treatment of deficiency diseases associated with other vitamins—thiamin, niacin, riboflavin, vitamin C and vitamin D.

Table 4.6: Vitamin Deficiencies Source

Deficiency disease (nutrient involved)	Symptoms	Treatment
Scurvy (Vitamin C)	<ul style="list-style-type: none"> ● Spongy bleeding gums, tiny blood spots on skin above knees 	<ul style="list-style-type: none"> ● Acute cases : Vitamin C administration intravenously Mild/moderate cases : Vitamin C tablets (500 mg/day)
Ariboflavinosis (riboflavin)	<ul style="list-style-type: none"> ● Cracking at corners of the lips 	<ul style="list-style-type: none"> ● One tablet B complex daily for one week to 10 days
Pellagra (niacin)	<ul style="list-style-type: none"> ● Skin changes symmetrical dermatosis on areas exposed to the sun ● Diarrhoea ● Glossitis ● Mental changes 	<ul style="list-style-type: none"> ● nicotinamide tablets (300 mg/day)
Beriberi (thiamin)	<ul style="list-style-type: none"> ● Loss of appetite ● Weakness or heaviness of legs – inability to squat ● Aphonia in infants ● Extreme weight loss in dry beriberi ● Feeling of pins and needles 	<ul style="list-style-type: none"> ● B complex tablets
Rickets (Vitamin D)	<ul style="list-style-type: none"> ● Skeletal deformities e.g. pigeon chest, knock knees, rachitic rosary, loss of muscle firmness ● Distended abdomen ● Development of milestones delayed. ● Delayed closure of anterior fontanelle in infants 	<ul style="list-style-type: none"> ● Vitamin D preparation given daily for about 4 weeks ● Calcium supplementation

e) **Iodine Deficiency Disorders (IDD)**

As the name indicates these disorders are caused by lack of iodine. Iodine is a component of the hormone thyroxine which helps to regulate body metabolism. Lack of iodine can cause impaired learning due to lowering of IQ, energy loss, reproductive losses, cretinism and goitre. In adult the thyroid gland, which produces thyroxine, gets enlarged. This is called goitre. Table 4.7 gives a summary of symptoms and control of IDD.

Table 4.7: Symptoms and Control of IDD

Symptoms of IDD	Control of IDD
<ul style="list-style-type: none"> ● Goitre ● Hypothyroidism indicated by varying clinical signs <ul style="list-style-type: none"> – Subnormal intelligence – Spasticity – Muscular weakness 	<ul style="list-style-type: none"> ● Consumption of iodized salt ● Injection of iodized oil. <ul style="list-style-type: none"> ● The oil should be injected intramuscularly every 3-4 years in the upper outer quadrant of the gluteal region in children and deltoid region in adults according to the following dose schedule: <ul style="list-style-type: none"> – 0-1 months-0.5 ml oil containing 37% by weight of iodine ● Thyroxine preparations in the form of tablets.

4.4 DIET IN DISEASES OF THE BODY SYSTEMS

You are already aware that each system of the body can break down in specific ways resulting in unique patterns of disease and abnormality. We will explore some of these diseases with particular focus on related problems and their solutions.

We begin with the diseases of the gastrointestinal tract.

4.4.1 Diseases of the Gastrointestinal Tract

The gastrointestinal system is made up of several organs, as you are aware. Therefore we will look at some of the diseases affecting specific parts of the GI tract such as oesophagus and stomach, small intestine and large intestines.

Look at Table 4.8. It explains the major problems associated with each disorder. It also specifies the features of dietary management in each case. We hope you will find this format a useful ready reference which will help you in your day-to-day work.

Table 4.8: Dietary Management of Various Disorders

Disorder	Major Problem	Dietary Management
Problem of the stomach and oesophagus		
Indigestion	Inability to digest food efficiently, heartburn, regurgitation, epigastric pain, flatulence, nausea and vomiting, feeling of fullness and bloating	Fluid, semisolid, bland diets given frequently in small amounts. Emotional tensions to be avoided.
Oesophagitis	Acute or chronic inflammation of oesophageal wall, due to gastric reflux	Bland, soft fibre-restricted diet; small frequent meals, weight reduction for obese individuals since excess abdominal fat is believed to increase gastric herniation and reflux. Antacid preparations are prescribed.
Oesophageal reflux	Reflux of gastric contents into oesophagus due to incompetence of the Oesophageal sphincters	Frequent small meals high in protein and restricted in fats. Reducing diets if overweight or obese. Avoidance of alcohol,

Disorder	Major Problem	Dietary Management
		<p>caffiene, chocolate, fatty meals and pepperment. (These lower the oesophageal sphinster pressure)</p> <p>High protein diet</p> <p>Restriction of fat</p> <p>Avoidance of foods lowering pressure on the lower oesophageal sphincter e.g. alcohol, caffiene, chocolate, fatty meals, peppermint</p> <p>Avoidance of acidic foods.</p> <p>Frequent small meals.</p>
Hiatus hernia	Herniation, substernal pain, belching, hiccupping after meals due to protrusion of a portion of the stomach through the oesophageal hiatus of the diaphragm	Small frequent meals, weight reduction diet if overweight. Early meals.
Gastritis	Inflammation of the mucosa of stomach leading to lack of appetite, discomfort, heart burn and severe vomiting	<p>Acute : Withholding food for 24-48 hours to allow stomach to rest and replacement of water and electrolyte losses due to severe vomiting. As improvement occurs start clear liquid , full fluid, semi solid and then solid diet based on tolerance by the patients.</p> <p>Chronic : Soft or bland diet and frequent feedings.</p>
Peptic Ulcer	Local erosion (wearing out) of mucosal lining of stomach that in contact with gastric juice. Pain in gastric region which may be burning, growing or piercing type and is relieved after eating.	More liberal approach practiced due to excellent drugs like comes cimetedine etc. Bland fibre restricted diet. Small frequent diet adequate in energy, protein and fat. Avoidance of alcohol, coffee, pepper and raw fruits, nuts, meat extrasts, (acid production and excessive motility to be avoided)
Common Problems of the Small Intestine		
Diarrhoea	Loose, frequent passage of grey, greasy, foul smelling, stools which may be loose or watery can cause dehydration. Severe thirst, drying of mouth, loss of skin elasticity.	<p>Oral intake of glucose, electrolyte solutions such as ORS or Oral Rehydration solution with progression to small frequent frequent bland feedings of foods.</p> <p>This is very important to restore losses of fluid and electrolytes and even tissue protein (in the case of prolonged and severe diarrhoea). So prevention of dehydration (i.e. lack of water and electolytes in the body) is our major aim.</p>
Constipation	Infrequent difficult passage of hard stools. Headache, coated tongue, foul breath and lack of appetite common	Coconut water, light tea, butter milk, rice water, ripe mashed bananas, khichri, bread and mashed boiled potatoes can be given. Regular diet and exercise, plenty of fibre and fluids to be consumed.

Disorder	Major Problem	Dietary Management
Problems of Large Intestines		
Irritable colon Syndrome (spastic colon)	Disturbances in normal motility of the colon	If constipated, use high fibre and fluid diet e.g. fruits, vegetables, whole grain pulses and cereals. In case of recurrent diarrhoea give bland, semisolid more frequently in small quantities.
Ulcerative colitis	Diffuse inflammatory and ulcerative disease involving mucosa and submucosa of large intestine leading to general debility, diarrhoea, weight loss, dehydration and anaemia.	Low residue, bland, high calorie, high protein diet. Supplementation with vitamins and minerals. Milk (1 cup), cottage cheese, eggs (nonfried), tender Chicken/fish, mildly flavoured vegetables, refined cereals and dehusted pulses, custard, jelly could be given.
Haemorrhoids	Dilated veins arteriovenous fistulas or displaced cushions of mucous membrane; bleeding and discomfort associated.	Bland, fibre-restricted diets

The chart which you have just studied has indicated the types of changes made in the diet? In general, a bland, fibre-restricted, low residue diet is recommended, particularly for conditions associated with inflammation or damage to the wall of the gastrointestinal tract. Such a diet gives rest to the gastrointestinal tract. The diet may progress from clear liquid, full liquid, pureed foods, mechanically soft foods to soft foods, normal food as indicated here:

- 1) **Clear liquid:** These are first foods given after surgery e.g. juice, gellatin or both
- 2) **Full liquid:** as soon as patient tolerates clear liquids full diet may be given e.g. juice, low fibre cooked cereal, milk, strained soup and custard.
- 3) **Pureed foods:** These are foods with a consistency of a paste. Cook (generally low fibre food) and blend it.
- 4) **Mechanically soft foods:** This refers to food with distinct pieces that are very tender and easy to chew.
- 5) **Soft foods:** These are like mechanically soft except pieces may require a little more chewing.
- 6) **Normal foods:** This is food eaten of normal consistency.

The bland diet suggested for the acute phase by the Expert Committee constituted by the Directorate General of Health Services (DGHS) is given in Table 4.9.

Table 4.9: The Bland Diet

Food Items	Amount (g)
Milk and milk products	1 litre
Egg/paneer	one/30
Rice or refined cereal	150
Dal	50
Cooked vegetable	200
Potatoes	50
Fruit	100
	One portion
Sugar	50
Oil	25

The guidelines suggested by DGHS for use in India also include the following convenient checklist for the bland diet. See Table 4.10.

Table 4.10: Selection of Food for Peptic Ulcer

Food permitted	Food not permitted
Milk, fresh curd, cottage cheese, cream, ice cream	Highly spiced foods
Bread without crust	Fried foods
Crisp dry toast or rusks	Tamarind
Maida/suji chapatias	Strong tea/coffee
Rice/ khichdi	High fibre foods
Noodles/macaroni	Vegetables with seeds like parmal, bitter gourd or karela
Porridge, cornflakes	
Washed dals, egg, fish, chicken	
Well cooked vegetables [stewed fruits]	
Sugarcane juice	
Whey water	
Plain biscuits	

Now let us pause to think about why such a diet is useful. Can you answer this question? This diet is recommended because it is protective to the gastrointestinal tract and keeps away irritating substances such as fibre and spices. In its most strict sense we speak about a diet which is chemically, mechanically and thermally non-irritating. This means not including chemically irritating foods (e.g. meat extractives, caffeine, alcohol, citrus fruits and juices and some spice foods), mechanical irritants (fibre), thermally irritating foods (e.g. foods ordinarily served as very hot or cold temperatures).

Activity 2

Compile the diet charts recommended in your hospital or clinic for

- Peptic ulcer
- Ulcerative colitis

Explain, in brief, the reasons for including the foods mentioned in specified amounts. You can use the space given here.

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Low Residue Diet

Let us now look closely at a very low residue diet (Table 4.11). Which are the foods allowed? Which are the foods not permitted? Read on to find out.

Table 4.11: Very Low Residue Diet

Foods permitted	Foods not permitted
Beverages: Light tea in limited amounts, carbonated drinks	Beverages: Milk and milk drinks
Cereals: Rice, rice flakes, puffed rice, macaroni, noodles, spaghetti and white bread	Cereals: Whole cereals
Pulses: Washed pulses (without outer Husk/skin)	Pulses: Whole pulses
Vegetables: Pumpkin and other gourd varieties	Vegetables: Green leafy vegetables, peas, ladies finger etc.
Cheese: Cottage	Cheese: Processed or any sharp flavoured
Desserts: Plain cake	Desserts: With fruits and nuts, pies, cream based desserts and milk desserts.
Custard, gelatin, ice cream pudding	Eggs: Fried, omlettes.
Eggs: Soft boiled, poached.	Miscellaneous: Nuts, popcorn pickles, excessive seasoning
Meat: in the form of soup	

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Is this diet almost fibre-free? Yes it is! It leaves only a minimum of residue in the intestinal tract. However, we must remember that low residue diets are deficient in vitamins and minerals. Hence, if this diet is to be continued for a considerable period of time, it is essential to give mineral and vitamin supplements.

As the patient improves, the dietary restriction also relax gradually and more foods from the not permitted list could be given.

The following list should also help:

High Fibre Foods

- 1) Whole cereals and pulses
- 2) Other green leafy fibrous vegetables
- 3) Fibrous fruits (pineapple, mango)

You may, at this stage, be wondering about the difference between low fibre and low residue diets. Low fibre diets contain minimal amounts of fibre. Low residue diets are almost fibre-free. In addition they only include foods which do not remain long in the intestine and stimulate bacterial growth.

Check Your Progress 1

- 1) Kasturi has been hospitalized for ulcerative colitis. She was fond of eating maize, wheat and bajra with plenty of whole, mixed pulses and green vegetables. She is finding it very difficult to adjust to her **new diet**. Which diet do you think is prescribed? Can you explain the reason why she has been prescribed this kind of diet?

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- 2) Match the following.

Column A	Column B
a) Irritable colon syndrome with recurrent diarrhoea	i) Bland low fibre
b) Diarrhoea	ii) High fibre
c) Peptic Ulcer	iii) Low residue diet
d) Constipation	iv) Fluid and electrolytes

- 3) Differentiate between a “low residue” and “low fibre” diet.

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Malabsorption Syndromes

We now move on to a very important set of disorders called malabsorption syndromes. What do you think the term means? You may already be aware of these disorders characterized by problems in absorption of certain nutrients. If fat absorption is affected, for example, fat will appear in large amounts in faeces. This is called **steatorrhoea**. Multiple abnormalities in absorption of several nutrients is a usual feature of this syndrome.

The kind of dietary modifications which need to be included are:

- increase in energy and protein content
- elimination of specific carbohydrates, protein or fats not tolerated
- modification in type of fat and carbohydrate
- vitamin and mineral supplementation
- soft or fibre-restricted diet

It has been shown that giving fats rich in **medium chain triglycerides (MCT)** is useful in certain malabsorption syndromes. Fats composed almost entirely of fatty acids containing 8-10 carbon atoms are referred to as MCT. These fats are digested rapidly by intestinal and pancreatic lipases. Using diets based on 5-70% of fat in the form of MCT has been reported to be successful in reducing steatorrhea and decreasing losses of calcium, sodium and potassium.

MCT therapy is particularly useful in pancreatic insufficiency. Do you know why? The pancreas secretes lipase; if the gland is not working efficiently lipase in the pancreatic juice will be inadequate.

As you have just read, if a particular enzyme is absent or fails to do its job, malabsorption results. One major example of this is **lactose intolerance**. This is due to the absence or deficiency of the enzyme lactase in the intestine.

What do you think could be a solution to this problem? One answer is prescribing a lactose-free diet. Milk is the major source of lactose sugar in our diets. If we eliminate milk and milk products from our diets then the food would be lactose free. Milk is a rich source of proteins, calcium and riboflavin. Replacing milk with groundnut or soya milk is a good idea. Many processed foods and medicines may have lactose as an ingredient, the labels must be read carefully.

In addition to the above, there are two other conditions we must talk about in some detail. These are short bowel syndrome and gluten enteropathy (coeliac disease).

Short Bowel Syndrome

Patient who have had large portions of their intestines removed (i.e. massive resection) suffer from **short bowel syndrome**. In this syndrome transit time is substantially reduced. What does the term, "transit time" mean? This is the time taken by the food eaten to pass through the gastrointestinal system. Since transit time is reduced, the food passes through the intestine in a hurry. This obviously affects absorption and can even be life threatening. Immediately after surgery total parenteral nutrition is used as the only source of nutrients and thereafter for one or two months. Then the patient is permitted oral intake of food - first carbohydrates (without fibre) and then, gradually, proteins and fats, as tolerance improves. Frequent small meals are recommended. Semi-synthetic fibre-free diets are also now available in the Western Countries.

Gluten Enteropathy

Now let us turn our attention to patients with **gluten enteropathy**. Patients with this disorder cannot tolerate the protein present in wheat called gluten. The disorder is also called **coeliac disease** in children, and adult **coeliac disease or nontropical sprue in later life**.

The obvious solution to this problem is elimination of gluten from diet. This means eliminating wheat, rye, barley, buckwheat and, in some cases, even oats. For us, in India, the desired effect can be achieved by eliminating wheat and wheat based products from the diet. Think of how difficult such a dietary modification is for a person whose main staple food is wheat.

The following Table 4.12 of foods-permitted and not permitted- should help you to advise patients and their families who may approach you.

Table 4.12: Foods, Permitted and Not Permitted in Gluten Enteropathy

Foods permitted	Foods not permitted
<ul style="list-style-type: none"> ● Rice, cornflour, soya products ● Skimmed milk ● Lean meat, fish, eggs, milk and milk products ● Sugar, honey ● All vegetables and fruits ● Butter, ghee and oils 	<ul style="list-style-type: none"> ● Wheat and wheat product—atta, suji, maida-biscuits, breads, noodles ● Whole milk ● Sweets in which maida is used ● Barley and oats

Usually patients of gluten enteropathy cannot tolerate fats well. Hence if fat restriction is recommended, butter, ghee, oils and all fatty foods are omitted.

Check Your Progress 2

- 1) List five foods that would be omitted from the diets of patients with: a) lactose intolerance, b) gluten enteropathy.

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- 2) What are the major problems associated with malabsorption syndromes? Answer in five lines.

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Let us move on to the next topic i.e. diet therapy in diseases of the liver, gallbladder and pancreas.

4.4.2 Liver, Gallbladder and Pancreatic Disorders

We begin with disorders affecting the liver. These include hepatitis and cirrhosis. In serious cases the person can go into coma. This condition is called hepatic coma. In each case the type of diet prescribed would vary. However the major aims of diet therapy in liver diseases include:

- Protection of the parenchymal cells of the liver using a nutritious diet;
- Emphasis on high quality protein to help tissue repair and prevent fatty infiltration of the liver, except in cases where the liver is severely damaged and cannot handle a high protein load due to encephalopathy
- High carbohydrate diet to improve glycogen reserves;
- Restricted fat.

Anorexia is a major problem for patients with liver disease. Hence, every effort has to be made to encourage the patients to eat. Appetizing, attractive meals are important for this reason. In most severely anorexic cases, a beginning has to be made with liquid foods followed by soft diet which may be preferred. As the patient convalesces, a wider range of foods could be introduced.

Table 4.13 Summaries the main points of dietary management of various disorders affecting the lives, gallbladder and pancreas

Table 4.13: Dietary Management of Various Disorders Affecting the Liver, Gallbladder and Pancreas

Disorder	Main Problem	Dietary Management
LIVER DISORDERS		
1) Hepatitis	Anorexia, fatigue, nausea, vomiting diarrhoea, fever, weight loss, abdominal discomfort, jaundice present	High carbohydrate, protein and moderate fat. Eat more frequent meals. Strongly flavoured vegetables, rich deserts, fried and fatty foods to be avoided. Supplements of B Complex recommended along with rest.
2) Jaundice	Jaundice is a symptom of liver disease. Yellow pigmentation of skin and body tissues. Weakness, fatigue, anorexia, weight loss, pain in abdominal region, flatulence, nausea and vomiting enlargement of liver.	Nutritious diet, High carbohydrate, high protein, low fat diets, (MCT's recommended) High carbohydrate Fat and protein intake less restricted
3) Cirrhosis	Gastrointestinal disturbances accompanied by nausea and vomiting, pain distention, jaundice, ascites, accumulation of abnormal amounts of fluid in the abdominal region can lead to neurological disturbances due to entrance of nitrogen containing substances like ammonia into the cerebral circulation without being metabolised in liver. Can lead to coma. The period before coma shows mental confusion, restlessness, hyperirritability, drowsiness and delirium.	High protein, high carbohydrate, moderate fat, vitamin rich diet. Small frequent meals to be given. Sodium restriction is recommended if oedema and ascites are present. Reduction of protein to a minimum level is necessary. Diet should be rich in calories to prevent tissue breakdown, glucose could also be given. After the condition of the patient improves good quality proteins may be given. High carbohydrate and moderate fats recommended (MCT to be given). Vitamin supplementation with vitamin C and B group. If oedema sodium and water intake limited.
DISEASES OF THE GALLBLADDER AND BILIARY SYSTEM		
4) Cholecystitis (inflamed gallbladder)		<ul style="list-style-type: none"> ● Low fat, non-irritating diet ● Gas forming foods i.e. those which produce flatulence may be restricted. Such foods are — corn, cabbage, cauliflower, onion, turnips, radish, dried feas, beans, rajmah, moth dal etc. ● Low residue diet in some patients
5) Cholelithiasis (gall stone formation)		<ul style="list-style-type: none"> ● Weight control to be emphasized ● Fat restricted diet ● Weight reduction recommended in case of over-weight/obese patients ● High fibre diet is believed to be useful ● Drugs and fluid diet based on fruit juice, glucose, sucrose and skimmed milk are prescribed
	In acute cases, associated with inflammation	
DISORDER AFFECTING THE PANCREAS		
6) Pancreatitis (inflammation of the Pancreas)		<ul style="list-style-type: none"> ● In acute conditions nothing to be given by mouth. ● As condition improves, progression from clear liquids to a bland-filtre-free semisolid to a solid diet according to patients tolerance ● After the attack, a high calorie but low fat diet is best. ● Small, frequent meals recommended

Diet for an adult patient with Viral hepatitis

Now here's an example of a diet for an adult patient with viral hepatitis accompanied by severe jaundice. The diet is a high carbohydrate, moderate fat and low protein.

Food/supplement	Amount (g/day)
Cereals	200
Skim milk	500
Potato	100
Leafy vegetables	50
Fruits (apple, mango, papaya, banana)	200
Fruit juice	400
Fats and oils	15
Sugar and jam	60
Multivitamin tablet	One

Source: Principles of Nutrition and Dietetics, M. Swaminathan, Bangalore Press, 1989, p. 388.

On the other hand, if jaundice is only mild to moderate, the following diet would be suitable—high carbohydrate, high protein and low fat diet.

Food/supplement	Amount (g/day)
Cereals	300
Pulses	50
Milk	800
Cheese	50
Vegetables	100
Fruits (Banana, Mango or Papaya)	300
Fruit juice	300
Butter and vegetable oil	30
Sugar and jam	60
Multivitamin tablets	One

Having gone through this discussion carefully you would have realized that two different types of diets are used in liver disorders. These are:

- High protein, moderate fat and high carbohydrate diet, and
- Fat/protein restricted diet.

Let us discuss the major features of each.

In the high protein, moderate fat and high carbohydrate diet, the energy contribution can be increased by adding nonfat dry milk to liquid milk. A soft diet, with six or more small feeds, is useful particularly if there is lack of appetite. Some patients may also be asked to restrict their intake of sodium.

No foods are omitted except those which the patient cannot tolerate. Problems have been reported with foods such as strongly flavoured vegetables, rich desserts, fried and fatty foods, chocolate, nuts and highly seasoned foods. However, **alcohol must be strictly avoided.**

In the fat-restricted diet, the following foods are to be avoided: beverages made of whole milk, cream or ice cream, whole milk products, rich sweets, fried eggs, cooking fat and cream.

Most liver diseases are treated with high carbohydrate, high protein, moderate fat diets. Liberal carbohydrate, low protein, fat and sodium and liberal amount of B-Complex and Vitamin C are recommended in severe cirrhotic conditions with ascites, coma and hepatic encephalopathy.

Check Your Progress 3

In cirrhosis of the liver:

1) Why are extra calories recommended?

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2) What is the role of extra carbohydrate?

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3) Should protein be restricted?

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4) Which foods should be avoided?

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4.4.3 Disorders of the Cardiovascular System

Population consuming rich, high density diets with high energy and large quantity of fat (particularly saturated fat and cholesterol and salt become increasingly prone to cardiovascular disease. Diet is, however, only one of several factors. In a competitive world other factors (life style factors) such as sedentary life style, heavy smoking and drinking and stress can worsen the situation. As a result of the disease process, fatty substances such as **cholesterol esters, cholesterol and triglycerides are deposited on the inside walls of arteries.** The deposit grows till it partially or completely blocks the lumen. This process is called **atherosclerosis** and is responsible for hypertension, angina pectoris, myocardial infarction cardiac failure and strokes.

The problems we will consider in some detail are as follows:

- Coronary heart disease and hyperlipidaemias
- Hypertension

Cardio-vascular Disease (i.e. problem such as angina pectoris and myocardial infarction) are associated in many patients with high levels of lipids circulating in the blood. Excess lipid in the blood is called **hyperlipidaemia.** The arteries soon get deposited by lipids and fibrous blood components including calcium and gradually obstruct the artery. This process

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of deposition of these components in the arteries is known as arteriosclerosis, small bits of the deposits called atheroma can be carried through the circulatory system and damage other organs.

If the obstruction occurs in the brain it is known as stroke. Complete obstruction of heart arteries can cause angina pectoris, myocardial infarction or heart failure. Let us see what are the multiple risk factors in cardiovascular disease.

Table 4.14: Multiple Risk Factors in Cardiovascular Diseases

Family History	.....	Hypertention, hyperlipidemia and Diabetes
Sex	.....	Higher incidence in males
Age	.....	30 and above
Overweight or obese	.....	Eat large quantities of refined food, saturated fats, salt and sugar and are physically inactive
Life style factors	.....	Heavy smoking, drinking and stress and tension.

Next, let us look at the management of cardiovascular disorders. Generally the therapy is based on four simple rules :

- 1) Consume adequate diet rich in whole cereals, pulses, vegetable and fruits. Reduce excessive fat in the diet (total fat, saturated fat and cholesterol). Restrict total calories and avoid refined foods. Food consumed should be enough to maintain weight which is ideal for you according to your height and age.
- 2) Restrict stimulants such as tea, coffee, cocoa and alcohol.
- 3) Take less refined sugar and salt in your diet.
- 4) Do physical activity like walking daily.

The cardiac patient must often learn to accept new meal patterns and, in many cases, stick to a low fat, low calorie diet. This is usually tough on the patient who feels that much of the pleasure in life is gone. Help him feel happy giving him other food alternatives, so that he is convinced and is encouraged to follow the diet prescribed. When you talk to a cardiac patient remember to tell him/her that the diet prescribed will:

- give a more nutritious and balanced meal and maintain good nutrition
- give the heart much needed rest and protect it against further complications such as angina pectoris and myocardial infarction
- prevent/ eliminate accumulation of fluid in the body i.e. oedema.

Let us now return to our discussion of dietary management of cardiovascular disorders.

In the acute phase of myocardial infarction or cardiac failure, the following diet is recommended according to the guidelines for standardized hospital diets specified by the Directorate General of Health Services.

A) 1000 Calories Liquid Diet During Acute Phase

Toned Milk and milk products	750 ml
Egg white	one
Fruits for juice	200 g
Vegetables for soup	200 g
Cereal (for porridge, bread)	100 g
Sugar	20 g
Oil (unsaturated)	10 g

What are the salient features of such a diet? This is a diet which is:

- low calori
- low fat and cholesterol
- sodium restricted

Can you comment on the frequency of feeding which is desirable? To reduce stress on the heart more frequent small intake of food liquid or semi solid could be given.

In severe myocardial infraction the following diet schedule may be adopted :

- 1-3 days: Clear fluid diet
- 3-6 days: **Karell diet** i.e. 800 ml milk given in four equal feeds i.e. 200 ml every 4 hours (provided the patient can tolerate milk and has no abdominal distention)
- 7-10 days: Semiliquid diet providing 800-1000 kcal
- 11-14 days: Soft diet providing 1200 kcal

The following diet described is suitable once the patient's condition has stabilized and the initial acute phase is over. Now, as the patient improves, he is put on a maintenance diet.

B) Maintenance Diet — 1800 Kcal

Milk and milk products	750ml
Egg white	one
Paneer/meat/chicken	30/50
Fruit	200 g
Dal (washed)	25 g
Vegetables (low fibre)	400 g
Cereal refined	200 g
Sugar	20 g
Oil (unsaturated)	15 g

Processed foods with high salt and even fat contents must be avoided.

Once the patient returns home he or she has to take special care in keeping the diet low in fat; and if problems persist, sodium as well as total intake of calories should be accordingly adjusted. Cholesterol sources, such as egg yolk and glandular meats are not permitted as the following list tells you. In addition to this fibre intake must be emphasized. Fibre has been shown to lower blood lipids.

Foods not Permitted

- Glandular meat e.g. kidney, liver, brain
- Whole milk, cream, ice cream, Indian sweets made with *khoa* and other preparations made of whole milk
- Butter, ghee, hydrogenated fat, coconut oil, palm oil
- Egg yolk, processed cheese
- Sweets of all kinds, cakes, pastries
- Dry nuts like almonds, walnut, groundnut, coconut
- Fried foods
- Cocoa and chocolate based drinks
- All aerated waters
- Alcohol based beverages and other products
- High sodium foods (if there is oedema) e.g. bread, biscuits, eggs, cakes, pastries, canned vegetables, soups and fruits, salted or smoked fish, chicken, cheese, salted nuts, peanut butter, salted pickles, samosas and other savoury preparations.

The key to dietary management of CHD is a low cholesterol, low fat, high fibre diet with sodium restriction. For overweight/obese subjects reduction in calories is necessary. Unsaturated fats and complex carbohydrates are recommended.

Hypertension, as you already know, refers to high blood pressure. Genetic and environmental factors —such as salt and dietary factors, alcohol, smoking, lack of physical

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activity and stress — could cause hypertension. It has been found that hypertensive patients benefit from diets low in sodium. What exactly do we mean by the word “low”? The normal diet contains about 3 to 6 g of sodium (3000 to 6000 mg sodium). Low sodium diets range from 200 to 700 mg, right upto 2000-3000 mg sodium, depending on the degree of restriction. Now recall if there are any other diseases where we mentioned the need for sodium restriction. Liver disorders and cardiac failure are examples. Table 4.15 specifies the level of sodium prescribed for different types of disorders.

Table 4.15: Degree of Sodium Restriction

Degree of sodium restriction	Level of sodium permitted (mg)	Description of diet	Disease condition
Extreme	200-300	No salt in cooking; selection of very low sodium foods	Severe congestive heart failure, cirrhosis of liver with ascites;
Severe	500-700	No salt in cooking; selection of low sodium foods	Severe congestive heart failure; severe renal disease with oedema in patients not on dialysis; cirrhosis with ascites
Moderate	1000-1500	No salt in cooking measured amounts of salt; salted bread and butter	Hypertensive patients
Mild	2000-3000	Some salt can be used in cooking but no salty foods permitted; no salt used at table	Maintenance diet in cardiac and renal diseases

Did you notice the restriction on salt? Table salt contributes most of the sodium in our diets. This is because it is a sodium compound — sodium chloride. Each gram of salt contains 400 mg sodium approximately. A teaspoon of salt would contain as much as 2000 mg of sodium.

One important point to remember is that salt content of food is not just what we add to it in cooking. In fact, salt finds its way into food as a natural component as well as a component used in manufacturing or preservation of food products. Processed foods are particularly high in sodium. These include canned foods, instant mixes, bakery foods ready-to-serve meals, pickles/preserves/relishes/sauces. Foods with added baking powder are high in sodium because baking powder is a sodium salt. Foods are not the only offenders. Several drugs are available in the market that contain sodium salts. It is important to look for these **hidden sodium sources**.

Can you imagine eating food without salt? It’s so difficult to eat, isn’t it? So what can we do to add spice to low sodium food? The answer is, in fact, mild spices and herbs such as aniseed, bay leaf, cardamom, cloves, cinnamon, cumin, curry leaves, garlic, ginger, lemon juice, mace, mint, pepper, saffron, sesame seeds, vinegar, parsley etc. could be incorporated to make the food tasty.

Here is a checklist of foods and food products, rich in sodium, to help you remember.

Foods Rich in Sodium		
Milk	Turnips	Pickles, sauces, papad
Eggs	Spinach	
Processed cheese/ Cheese spread	Beet greens	Ready to eat processed foods (canned and frozen)
Meat	Carrots	Salted mixtures, popcorn, Chips Commercial salad
dressings		
Poultry	Knol Khol	Check labels on your medicines
Fish		
Salted nuts	Losus Stem	

If the patient is put on diuretics, high potassium foods such as fruits should be emphasized. Even otherwise, high potassium levels are believed to have a protective effect.

Hypertensives are recommended low sodium, high potassium, low cholesterol diets; weight reduction if over weight/obese is also essential. The type of fat recommended is unsaturated.

Check Your Progress 4

1) Read the following case study carefully.

One week ago Mr. Prasad, with myocardial infarction, was admitted to the intensive care unit of a hospital. He is 40 years old and 10 kg overweight. His job took him to business lunches and dinners and drank 6 cups coffee .daily Mr. Prasad’s blood pressure was 180/110 on admission to the ICU but later stabilized at 140/88. Blood lipids, cholesterol and triglycerides were high. Mr. Prasad has been treating himself for an indigestion problem with antacid tablets. Now answer the following questions.

a) What kind of diet should be recommended for Mr. Prasad after the acute phase is over?

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b) Comment on the changes he would have to make in his lifestyle, dietary patterns and use of drugs, such as antacids, when he gets back home.

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2) Match the following.

Diet	Disease
i) Low cholesterol, low fat, high fibre diet with sodium restriction	a) Liver diseases
ii) Low cholesterol, sodium and high potassium	b) Cardiac failure
iii) High carbohydrate, high protein and low Fats	c) Hypertension
	d) Myocardial infraction

3) The sodium restricted diet is quite tasteless. What would you suggest to make the food more tasty?

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4.4.4 Diseases of the Urinary System

The kidney has a vital role to play in maintaining life and health. You may recollect the three primary function of the kidneys—excretory, endocrine and metabolic. Kidney is an efficient filter of the body, it maintains normal composition and volume of blood. It excretes waste materials and regulates the electrolyte and water balance. It flushes out toxic substances.

We will not explore all these functions here in this unit. You may have already learnt about these functions earlier as part of the physiology course. However, you can understand that, far-reaching effects can result with kidney dysfunction.

1) **Renal Failure**

So let us now talk about the special needs of patients suffering from acute and chronic renal failure as well as the needs of the patients on dialysis.

a) *Acute renal failure*

This condition is characterised by a sudden fall in the glomerular filtration rate (GFR) by the glomerulus. This fall leads to **appearance of urea in the blood or uraemia**. Oliguria with a urine flow of less than 15 ml per minute is common. However this is not always the case.

The major features of diet therapy for acute renal failure are as follows :

- Fluid intake should equal primary output and other measured extrarenal losses of water (e.g. Fistulae drainage, nasogastric aspirate, diarrhoea, vomiting) plus 400 ml/day. This accounts for water production due to metabolic reactions as well as insensible water losses (through skin, respiration).
- If the patient is catabolic, weight should be allowed to decrease by 0.2 to 0.5 Kg/day to avoid excess accumulation of fluid.
- Sodium, potassium, phosphorus and magnesium intake should be restricted to prevent accumulation of these minerals.
- Energy, and if feasible, protein intake should satisfy the patient's nutritional requirements. Requirements may exceed normal in some cases. There is also evidence that restricting protein intake may be helpful in preventing renal damage. The final decision would depend on the condition of the patient and whether or not dialysis being carried out. Therefore:
 - To a patient who has lost lot of weight, it might be better to give a liberal intake of nutrients in combination with dialysis;
 - A patient with almost normal excretion of urine may receive larger quantities of nutrients since there is less risk of developing fluid and electrolyte disorders or accumulating potentially toxic metabolites;
 - For a patient with little or no urine flow and who is not uraemic, intake of restricted quantities of water, minerals and amino acids may reduce the need for dialysis;
 - In a patient who is starting to recover from acute renal failure, a high calorie diet providing small amounts of essential amino acids with little or no protein may be useful.

b) *Chronic renal failure*

In chronic renal failure, the nephrons are damaged and lost in a progressive manner. This leads to permanent impairment of the renal function.

Some patients exhibit what is called "**nephrotic syndrome**". It occurs generally in children. It is a gradual degeneration in the capillary and basement membrane of the glomerulus. As the degeneration process continues the tissue pore increases and allows passage of protein into the filtrate. This loss lowers the serum albumin concentration in the blood leading to oedema. As the protein level falls the cholesterol level increases. Due to massive loss of proteins the tissue proteins break down leading to malnutrition. Nephrotic patients are often extremely thin and also suffer from deficiency of vitamins especially vitamin D. This means that nephrotic patient can have a wide variety of deficiencies. Neglect in management of nephrotic syndrome can lead to chronic renal failure.

Besides malnutrition the usual clinical symptoms of chronic renal failure are loss of weight, anemia, hypertension and bone problems. The management has to be individualized because it depends on the degree of renal insufficiency. The diet must take into account the energy required, the protein content, fluid, acid base and the electrolyte balance. The two important principles to be kept in mind are:

- 1) To maintain good nutritional status.
- 2) Retard further progression of renal failure

The abnormalities shown include:

- retention of nitrogenous waste products
- decreased ability to excrete or conserve sodium with changes in dietary intakes.
- increase in the minimal level of water which the kidney must excrete (renal obligatory loss of water)
- inability to regulate water, potassium, magnesium and aluminium losses
- retention of phosphate
- hypocalcaemia
- impaired intestinal absorption of calcium
- relative or absolute deficiency in the normal function to convert inactive vitamin D form to its active vitamin D form.
- excess breakdown of muscles of the body leading to the wasting syndrome.

As you can see, the problems are quite complex usually requiring complex solutions. We have summarized in the following chart, specific nutritional interventions required in relation to certain key nutrients (see Table 4.14).

Table 4.16: Specific Nutritional Interventions in Chronic Renal Failure

Nutrient	Intervention required
Energy	<ul style="list-style-type: none"> ● More than or equal to 35 Kcal per kg desirable weight per day unless the patient is obese or gaining too much weight ● Intake of complex carbohydrates and fibre is emphasized in oral feeding if the patient can tolerate it
Protein	<ul style="list-style-type: none"> ● GFR more than 70 ml/min : no dietary restriction of protein unless renal function is continuing to decline ● GFR 25-70 ml/min : 0.60 to 0.70 g protein/kg/day of which at least 0.35 g/kg/day is of good quality protein ● Chronic renal failure without dialysis : GFR less than 25 ml/min : low protein diets with supplements of amino acids 16-20 g protein per day (about 0.28 g protein/kg/day) ● GFR less than 5 ml/min. Dialysis must be started and more liberal intake of proteins is permitted ● In nephrotic syndrome : 0.60 g food quality protein/ kg/day plus 1.0 g for each gram of urine protein loss each day Fat (lipid) ● About 40% of total calories as fat if the level of triglycerides in the blood is not showing an increase ● Fat content raised to 55% of total calories (carbohydrates reduced to 35%) if there is elevation of blood triglycerides
Phosphorus	<ul style="list-style-type: none"> ● Restricted
Calcium	<ul style="list-style-type: none"> ● Supplementation 1000 - 1400 mg/day required once phosphate concentration in serum is normal
Magnesium	<ul style="list-style-type: none"> ● Restricted intake of magnesium containing preparations such as antacids and laxatives. A total intake of 200 mg/day may be required in chronic cases not on dialysis. This is supplied by a 40 g protein diet Sodium ● Nondialyzed patients: 1000-3000 mg/day ● Dialyzed patients: 1000-1500 mg/day
Potassium	<ul style="list-style-type: none"> ● Restricted
Trace elements	<ul style="list-style-type: none"> ● Supplementation with iron often required in both dialyzed and non-dialyzed patients
Vitamins	<ul style="list-style-type: none"> ● Supplementation according to need of vitamin C
Fluid	<ul style="list-style-type: none"> ● Nondialyzed patients: 1500-3000 ml/day ● Dialyzed patients: 700-1500 ml/day

Source: Based on data given in Modern Nutrition in Health and Disease edited by M.E. Shils and V.R. Young, 1988, pp. 1230 - 1269.

For renal failure diets depend on the condition of the patient and must be individualised whether dialysis is used or not. Generally diets are high carbohydrate, moderate fat, low protein, with sodium and potassium intake restricted.

Our discussion so far has focussed on the interventions which seem to be most effective based on current research. However, what has been recommended in routine hospital practice in your hospital?

Dietary regimen in hospitals for acute and chronic renal failure patients.

In acute renal failure the dietary regimen consists of 400 g glucose and 100 g refined groundnut oil made into an emulsion in 1 litre of water with the daily requirements of vitamins. This is administered by drip through a nasogastric tube. Some physicians administer only 100 g glucose in one litre water to prevent diarrhoea. Once urine flow is resumed, more fluids are given in the form of milk, fruit juice etc.

Patients with chronic renal failure are prescribed diets low in protein. The diet is salt-free. It is low sodium and low potassium as well. The protein given is of good quality i.e. animal sources. This minimizes the load on the kidneys. At the same time the effort also has to be to prevent protein from being broken down to provide energy. The answer to this is providing enough calories in the form of carbohydrates and fats.

Standardized hospital diets for renal failure are as follows:

i) **> 40 g protein diet**

Milk and milk products	350ml
Egg/paneer	one/30 g
Paneer	30 g
Cereals	150 g
Potato/root vegetable	100 g
Sago	50 g
Arrowroot powder	100 g
Unsalted butter	25 g
Cooking fat	25 g
Sugar	50 g

ii) **> 20 g protein diet**

Milk and milk products	200ml
Egg/paneer	one/30 g
Cereals	100 g
Potato/root vegetable	100 g
Sago	100 g
Arrowroot	100 g
Unsalted butter	25 g
Cooking fat	25 g
Sugar	75 g

iii) **> 30 g protein diet**

Milk and milk products	250ml
Egg/paneer	one/30 g
Paneer	30 g
Cereals	75 g
Potato	100 g
Other vegetables	100 g
Fruit	100 g
Sago	100 g
Arrowroot powder	100 g
Unsalted butter	25 g
Cooking fat	25 g
Sugar/glucose	50 g

Sugar can be increased in both the 20 g and 30 g protein diets. **Salt cannot be used in cooking. In addition, foods such as green leafy vegetables should be boiled and the water discarded since these foods are sodium rich.**

The foods avoided in renal failure include:

- extra milk or milk products
- meat, fish, chicken, extra egg
- pulses, extra cereals, legumes, peas, beans
- dry fruits, groundnuts, coconut
- cashewnut and other nuts
- cakes, pastries, jam, jellies
- squashes, lemon, fruit juices
- vegetables rich in sodium and potassium such as dried peas, spinach

We have so far discussed the major features of dietary management of nephritis and renal failure. We now turn to a very common problem in India — kidney stones or renal calculi.

Renal Calculi

Kidney stones may be found in the kidney itself, ureter, bladder or urethra. They are made of organic matrix into which crystals of various sizes may be embedded. Different chemical types of calculi occur and depending on the composition the dietary management is recommended. The same is summarized in the chart below:

Composition of stone	Food not permitted
Uric acid and urates	Meat and meat products - the glandular meat like liver, kidney and brain, sweet bread-shellfish, dals, whole grain cereal, oatmeal, dried peas and beans, spinach
Oxalate	Green plantain, grapes, tomatoes colocasia, sweet potatoes, beetroot, currants, figs, almonds, cashewnut, spinach and other green leafy vegetables, tea, cocoa
Phosphate or carbonate	Whole grain cereals, meat, fish, eggs, milk, nuts and legumes

Since urinary calculi are formed in combination with calcium, intake of calcium should also be restricted. Foods particularly rich in calcium e.g. milk and milk products, leafy vegetables, sesame seeds or til seeds, and ragi are restricted.

It is very important to ensure that fluid intake should be high. This makes the urine dilute and lessens chances of precipitation of crystals in the form of stones. A urine output of 2-2.5 litres a day is considered safe. During hot, humid weather with excessive sweating, extra fluids must be taken.

Patient with renal calculi must eat less of foods containing uric acid/oxalate/ phosphate/ carbonate. A high fluid intake is a must.

Check Your Progress 5

Read through the following case study carefully and answer questions (a) and (b).

After a severe streptococcal infection of the throat Mrs. X a housewife (25 years) was admitted to the hospital. Her history revealed that she had neglected the throat condition for several weeks, before seeking medical attention. Mrs. X complained of weakness, headaches, shortness of breath and loss of appetite. Her throat had apparently healed before admission. Upon examination her blood pressure was 156/98. Other vital signs were within normal limits. Mrs. X reported a lower volume of urine than usual. Urine analysis showed large amounts of proteins and blood in the urine. She also exhibited oedema on both legs. Mrs. X was placed on complete bed rest and prescribed antibiotics and diet therapy.

a) What is Mrs. X suffering from?

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b) List the salient features of nutritional care in her case.

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4.4.5 Diseases of the Musculoskeletal System

We will concentrate only on arthritis and gout in this discussion.

Arthritis is an inflammation of the joints. There are several types of arthritis. However, in all cases the dietary objective is usually to prevent obesity. Obesity is harmful because it adds extra weight that has to be supported by the joints. To prevent obesity, a **low calorie diet** may be required.

Gout is a condition of metabolic origin resembling arthritis in that the joints become swollen and painful. It is caused by accumulation of uric acid.

The dietary management during the acute stage of gout is a **low purine diet**. Fats should be kept at a low or normal level because they interfere with the body's ability to excrete uric acid products. Obese patients are put on weight reduction diets which we will talk about in the next unit.

Table 4.17 presents a summary of foods permitted and not allowed based on the purine content.

Table 4.17: Foods permitted/included or omitted

FOODS OMITTED (high purine content) (I)	FOODS PERMITTED (negligible purine content) (II)	FOODS INCLUDED (Moderate Purine given in non acute stage) (III)
● Fish (herring, salmon, sardines)	● All vegetables except brinjal, spinach and mushrooms	● Fish (pomfret, shellfish, meat and chicken)
● Glandular meat (liver, brain, kidney, meat extract)	● All fruits except custard apple, chikoo	● Pulses — beans, lentils, peas etc.
● Sweet breads	● Milk and milk products including cheese, butter	● Vegetables — brinjals, spinach, mushrooms
● Mushrooms	● Eggs ● Fats ● Sweets and sugars ● Cereals and bread	● Fruits — custard apple, chikoo

In addition to this restriction on purine-containing foods, a liberal fluid intake is advised. An urine excretion of about 2000 ml is considered adequate. Alcohol should be avoided. Restriction on consumption of tea and coffee is also recommended.

A low purine, low fat, easily digestible diet, with liberal fluid intake, is good for gout.

This brings us to the end of this unit. It has been a long unit. The reason was that we tried not to miss out on information that you would find useful.

4.5 LET US SUM UP

This unit discussed the dietary management of nutritional deficiency disorders as well as disorders related to the gastrointestinal tract, liver, gallbladder and pancreas, the genitourinary system, cardiovascular system and the musculoskeletal system.

In summary, the nature of the diets recommended for these conditions are:

- High calorie, high protein diet for PEM; vitamin and mineral supplements in other deficiency diseases.
- Bland fibre-restricted diet for diseases of the oesophagus, stomach and duodenum.
- Very low residue diets or high fibre diets in the case of disturbances of the small intestine and colon.
- High protein, high carbohydrate, moderate fat diets or fat restricted diets in case of disturbances of the liver, gallbladder and pancreas.
- Medium chain triglyceride diet, lactose restricted diet, sucrose restricted diet, and gluten restricted diet for malabsorption syndromes.
- Fat and energy controlled diets for CHD; and sodium and fat restricted diets for hypertension.
- Sodium restricted diet for acute and chronic heart diseases.
- Controlled protein, potassium and sodium diet for kidney diseases.
- Purine restricted diet for gout.

4.6 KEY WORDS

Exocrine	:	Refers to the function of producing enzymes which are directly released into the gastrointestinal tract in order to act on food
Fatty infiltration	:	Accumulation of fat in parenchymal cells of the liver (indication of liver damage)
Hyperlipidaemia	:	High levels of circulating lipid and cholesterol circulating in the blood
Incompetence	:	Improper functioning load; refers to stress imposed by a nutrient or drug in amounts higher than need
Reserve	:	Store or extra amounts in the body over and above that normal amounts needed
Spectrum	:	Range of disease condition

4.7 ANSWERS TO CHECK YOUR PROGRESS

Check Your Progress 1

- 1) High energy, high protein, low residue diet—such a diet helps the intestinal lesions to heal and underlying sepsis/infection to clear. Low residue diet is important so that there is no irritation to the intestine.
- 2)
 - a) v
 - b) iv
 - c) i
 - d) ii
- 3) All low residue diets are low fibre diets but not vice-versa. Residue means matter adding to intestinal bulk. Fibre is one such substance. Then there are foods like milk which remain in the intestine for long periods and are associated with increased bacterial activity. Similarly, other foods which remain in the intestine longer and carry a heavy microbial load are high residue foods.

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Check Your Progress 2

- 1)
 - a) Milk, cheese, khoya, milk powder, paneer, ice-cream
 - b) Wheat, wheat products e.g. suji, maida, wheat based processed foods such as biscuits, breads, noodles
- 2) The major problems in malabsorption syndromes include structural and functional abnormalities in the intestines. This leads to poor absorption of one or more nutrients accompanied by diarrhoea. Some of the syndromes are caused by an intolerance of certain components in food e.g. gluten in wheat or lactose in milk. The latter is due to improper functioning or lack of the intestinal enzyme lactase.

Check Your Progress 3

- 1) Extra calories are recommended because this aids in the recovery process and prevents utilization of proteins for energy production
- 2) Carbohydrate is protective to the liver and prevents fatty infiltration. It also has protein sparing action.
- 3) No. Fairly high protein intake is necessary, the protein being of good quality.
- 4) Foods rich in fibre, fat and sodium

Check Your Progress 4

- 1)
 - a) A maintenance 1800 kcal diet low in calories, low in fat (particularly omission of cholesterol sources) and low sodium diet
 - b) Vigorous exercises would have to be avoided. However, mild exercise is good such as walking. He must also maintain a low calorie, low fat, low sodium diet. Sodium-containing drugs such as antacids also must be avoided.
- 2)
 - i) d
 - ii) c
 - iii) a
- 3) Answer based on flavours/flavouring agents already listed or others you can think of.

Check Your Progress 5

- a) Acute renal failure due to infection
- b) Energy intake should be normal; intake of small amounts of protein may be advised. Iron supplementation and a diet restricted in sodium would be advised.