

## **Clinical and Therapeutic Nutrition**

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## MANUAL INTRODUCTION

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The practical manual for the course '*Clinical and Therapeutic Nutrition*' (MFNL-005), has been so designed to train individuals to function as medical nutrition therapist. It focuses on providing knowledge and developing appropriate skills and attitudes in learners for nutritional diagnostic, counseling services and planning diets for the purpose of disease management. Examples of conditions treated with medical nutrition therapy include cardiovascular disease, congestive heart failure, eating disorders, food allergies (such as sprue and lactose intolerance), hyperlipidemia (high cholesterol), hypertension (high blood pressure), irritable bowel syndrome, non-insulin dependent diabetes (type 2), insulin dependent diabetes (type 1), chronic renal (kidney) disease, enteral nutrition, weight management for adults and children etc. This practical manual will provide an in-depth review on proper diet, lifestyle strategies and therapeutic nutrient intervention to correct nutritional insufficiencies, promote optimal health, and prevent, manage, or correct some of these medical problems.

MFNL-005, the '*Clinical and Therapeutic Nutrition*' practical course is worth 2 credits (i.e. 60 study hours) and consists of 9 practicals with suitable activities at the end of each practical for a thorough understanding of the subject by the students. Starting from understanding the fundamental principle of diet planning and use of food composition tables and exchange list for planning diets to planning therapeutic diets for disease conditions are covered in this manual. A brief review of each of the practical included in this manual follows.

*Practical 1* focuses on the fundamental principles of meal planning, with a focus on understanding exchange list and food composition tables – the basic tools used for planning diets. This is the basic preparatory practical for learners. The practice activity included in this practical will help the learners understand the concept and use of exchange list/ food composition table in planning diets for different disease conditions covered in this manual.

Sometimes person cannot eat any or enough food because of an illness. The stomach or bowel may not be working quite right, or a person may have had surgery to remove part or all of these organs. Under those conditions, nutrition must be supplied in a different way. *Practical 2* discusses the special feeding methods, with special focus on enteral nutrition. What are the different types of enteral feeds and their characteristics? How to prepare home blend tube feeds? These are a few aspects covered in this practical. Undertaking the two activities included in this practical will help the learners plan and prepare blenderized feeds for ill, malnourished patients and get a deep insight into the various commercial enteral feeds available in the Indian market.

*Practical 3* deals with the nutritional implications of fever and the dietary management of different types of fevers. Undertaking the two activities included in this practical will equip the learners to plan diets for patients suffering from typhoid and tuberculosis, which are acute and chronic fevers, respectively.

The epidemic of obesity with its attendant co-morbidities – heart disease, hypertension, stroke and diabetes – is a problem fast emerging as a public health concern in our country. On the other hand, underweight or the inability to gain weight/achieve and maintain an ideal (normal) body weight is already a big public health issue which needs to be addressed.

*Practical 4* describes the various practical aspects of weight management. The various principles of dietary/ life-style management have been highlighted including the two activities which will help the learners learn/improve their skills pertaining to the overall assessment and management of under/over-weight conditions in a spectrum of physiological/clinical situations.

*Practical 5* deals with the nutritional management of metabolic disorders. The various practical aspects/principles of dietary management which are imperative for the successful treatment/management of diabetes mellitus and gout, are included in this practical. The three activities included in this practical would help the learners internalize the step-by-step process required for individualized diet planning as per the requirements of the patients.

*Practical 6* introduces the dietary management of some of the disorders of the gastrointestinal tract namely peptic ulcer, ulcerative colitis and lactose intolerance. In order to prevent the development of these disorders, the gut must remain healthy so that the GI tract functions can be carried out normally. Nutrition, therefore, plays an important role in the management of these disorders. By undertaking the three activities included in

this practical, the learners will not only be able to counsel patients regarding what foods to include or exclude in the diet but also be able to plan nutritious meals for patients suffering from these disorders.

*Practical 7* covers the diseases of the liver, gall bladder and pancreas. Hepatitis, cirrhosis, cholecystitis/cholelithiasis and pancreatitis are the major diseases which are included in this practical. The three activities included in this practical will help learners understand and learn about the applied aspects related to working out a day's diet for each of these diseases.

The various renal problems followed by the nutrient requirements during these conditions and the translation of nutritional requirements into suitable food sources as per the RDI so as to result in the development of an appropriate diet is the focus of *Practical 8*. The five activities included in this practical will help learners plan diets for renal diseases including glomerulonephritis, nephrotic syndrome, chronic/acute renal failure and nephrolithiasis.

Coronary heart diseases are a group of diseases of the heart. *Practical 9* focuses on some of these conditions namely hypertension, atherosclerosis, myocardial infarction and congestive heart failure. The main focus in this practical is on the dietary guidelines and principles involved in planning diets for these heart conditions. There are three activities in this practical.

There are 14 sessions planned for you for this practical component of the Clinical and Therapeutic Course (MFNL-005). Each session will be of 4 hours. Each session will be preceded by a *PRE-LAB* session, where the instructions/important points shall be discussed by the counselor with you and followed by a *POST-LAB session*. At the post-lab you will be expected to hand in written work relating to the practical, unless other arrangements have been announced. Conclusions from the practical exercises and any problems arising during the practical will be discussed. Attendance at Pre, During and Post Lab sessions is an essential part of the practical course. Non-attenders may be penalised. Practical laboratory work will contribute 40% to the assessment of this course (MFNL-005). Sixty per cent weightage is for the term-end practical exam. Examinations will be held in the 15th session at the end of the practical course being undertaken by the learner. The examination shall be of 6 hour duration and shall be based on material presented in the manual and in the class.

A sample format of the practical/activities to be conducted during the 14 sessions is enumerated herewith. The final format shall be given to you by your course counselor. The programme study centre coordinator shall arrange for the practical course work. So please be in touch with the coordinator for the allotment of the practical schedule.

#### Format for Practical Session

SESSIONS/ DURATION	PRACTICAL/ACTIVITY
I (4 HOURS)	<b><i>PRACTICALS 1 and 2</i></b> Introduction to the Manual Discussion on Exchange List and Food Composition Tables and How to Use them in Diet Planning Instructions Related to Practical 2 and How to Carry Out a Survey. <i>Activity 1:</i> Review Exercise: Diet Planning Using the Exchange List and the Food Composition Table
II (4 HOURS)	<b><i>PRACTICAL 2: Special Feeding Methods</i></b> <i>Activity 1:</i> Planning Home Blend Feeds <i>Activity 2:</i> Survey for Commercial Enteral Feeds Available in the Indian Market
III (4 HOURS)	<b><i>PRACTICAL 3: Nutritional Management of Fevers</i></b> <i>Activity 1:</i> Diet Plan for Typhoid <i>Activity 2:</i> Diet Plan for Tuberculosis Preparing one dish from each activity
IV (4 HOURS)	<b><i>PRACTICAL 4: Nutritional Care of Weight Management</i></b> <i>Activity 1:</i> Diet Plan for Overweight Obese Individuals <i>Activity 2:</i> Diet Plan for Underweight Individuals Preparing one dish from each activity
V (4 HOURS)	<b><i>PRACTICAL 5: Planning Diets for Metabolic Diseases</i></b> <i>Activity 1:</i> Diet Plan for Non-Insulin Dependent Diabetes Mellitus (NIDDM) <i>Activity 2:</i> Diet Plan for Insulin Dependent Diabetes Mellitus (IDDM)

VI (4 HOURS)	<b><i>PRACTICAL 5: Planning Diets for Metabolic Diseases</i></b> <i>Activity 3: Diet Plan for Gout</i> Prepare one dish from each activity in Practical 5.
VII (4 HOURS)	<b><i>PRACTICAL 6: Nutritional Management of Gastrointestinal Disorders</i></b> <i>Activity 1: Diet Plan for Peptic Ulcer</i> <i>Activity 2: Diet Plan for Ulcerative Colitis</i>
VIII (4 HOURS)	<b><i>PRACTICAL 6: Nutritional Management of Gastrointestinal Disorders</i></b> <i>Activity 3: Diet Plan for Lactose Intolerance</i> Prepare one dish from each activity in Practical 6.
IX (4 HOURS)	<b><i>PRACTICAL 7: Nutritional Management in Liver, Gall Bladder and Pancreatic Diseases</i></b> <i>Activity 1: Diet Plan for Hepatitis</i> <i>Activity 2: Diet Plan for Liver Cirrhosis</i> Prepare one dish from each activity
X (4 HOURS)	<b><i>PRACTICAL 7: Nutritional Management in Liver, Gall Bladder and Pancreatic Diseases</i></b> <i>Activity 3: Diet Plan for Cholelithiasis/Cholecystitis</i> <i>Activity 4: Diet Plan for Pancreatitis.</i> Prepare one dish from each activity
XI (4 HOURS)	<b><i>PRACTICAL 8: Planning Diets for Renal Diseases</i></b> <i>Activity 1: Diet Plan for Glomerulonephritis</i> <i>Activity 2: Diet Plan for Nephrotic Syndrome</i> Prepare one dish from each activity
XII (4 HOURS)	<b><i>PRACTICAL 8: Planning Diets for Renal Diseases</i></b> <i>Activity 3: Diet Plan for Chronic Renal Failure</i> <i>Activity 4: Diet Plan for Acute Renal Failure</i> <i>Activity 5: Diet Plan for Nephrolithiasis</i> Prepare one dish from each activity
XIII (4 HOURS)	<b><i>PRACTICAL 9: Nutritional Management of Coronary Heart Diseases</i></b> <i>Activity 1: Diet Plan for Hypertensive</i> <i>Activity 2: Diet Plan for Acute Myocardial Infarction and Hypercholesterolemia</i>
XIV (4 HOURS)	<b><i>PRACTICAL 9: Nutritional Management of Coronary Heart Diseases</i></b> <i>Activity 3: Diet Plan for Congestive Heart Failure</i> Prepare one dish from each activity in Practical 9.

### RECORDING PRACTICAL WORK

The practical manual for the course is actually a workbook. It contains not only the background information and concepts necessary for you to conduct the exercises, but it also serves as a practical file or workbook. You are expected to write your observations, calculations, results, inference, conclusions etc. related to a particular activity in the manual itself in the space specified. Record the practical work directly into the bound practical manual (workbook), never on loose-leaf sheets. Every entry in the practical manual should be dated, and your own observations (including comments such as the difficulties you found in doing certain procedures, or ideas that occurred to you) should be written down as a permanent record. Recognize that your practical manual is the true record of what you did and observed at the time. You can (if you wish) use the back pages of your practical manual for making calculations, note etc.

**LIST OF ACTIVITIES**

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# PRACTICAL 1 EXCHANGE LIST AND FOOD COMPOSITION TABLES FOR MEAL PLANNING

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## Structure

- 1.1 Introduction
- 1.2 The Food Composition Table
- 1.3 The Exchange List
  - 1.3.1 Steps in the Development of Exchange List
- 1.4 Steps in Planning Diets
- 1.5 Review Exercise

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## 1.1 INTRODUCTION

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This first practical in the manual will orient you to the concept of the food composition table and the exchange list. This is a basic practical, which will prepare you for planning diets for different individuals and disease conditions. The basic steps to be followed in planning diets are also highlighted in this practical. This information will equip you to carry out the various activities included in this manual. So study this practical very carefully. Understand the principles explained herewith and carry out the review exercise given at the end of the practical so as to internalize the concepts.

### Objectives

After undertaking this practical, you will be able to:

- explain the concept of the food composition tables and the exchange list,
- enlist the steps involved in planning diets, and
- use the food composition table and the exchange table in planning diets.

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## 1.2 THE FOOD COMPOSITION TABLE

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The nutritive value of foods can be calculated from the Food Composition Tables. The food composition tables for Indian foods give the nutritive content or composition of almost all common Indian foodstuffs available in our country. These Tables have been developed by the National Institute of Nutrition (a unit of the Indian Council of Medical Research), Hyderabad. The Tables under the title “Indian Food Composition Tables, 2017” are now available. As a student of Dietetics and Nutrition, certainly you may have used this book some time. If not, we suggest you obtain a copy of this book or you can download PDF version from internet.

The food composition tables provide information regarding the energy, protein, fat, carbohydrate, fibre, mineral (calcium, phosphorous, iron) and vitamin (vitamin A, vitamin C, thiamin, riboflavin, niacin, folic acid and vitamin B<sub>12</sub>) content of various commonly used foodstuffs in Indian households. The nutrient content of foodstuffs given in the Table is based only on the 100 g edible portion of raw foodstuffs. By *edible portion* we mean *the portions of the food stuffs which are really consumed/eaten*. For example, in case of peas, the edible portion is the peas inside the pod. The inedible portion is the pod or shell, which we throw away. In case of foodstuffs like milk, atta etc., these are 100 per cent edible. The food composition tables can thus be used to calculate the nutrient content of edible portion of the foodstuffs for amounts consumed. These can also be used for calculating the nutritive content of a meal or a dish.

At this stage, we suggest you undertake a small exercise, whereby you calculate the nutritive value of a meal using the Food Composition Table. You may calculate the nutritive value of the meal you have just consumed or perhaps calculate the nutritive value of the meal given herewith. Calculate the energy and protein content of the meal for the amounts specified against each ingredients in the format given herewith.

**Table 1.2: Summary of RDA for Indians, 2010**

Group	Particulars	Body Wt. kg	Net energy kcal/d	Protein g/d	Visible Fat g/d	Calcium mg/d	Iron mg/d	Vit. A µg/d Retinol	β-carotene	Thiamine mg/d	Riboflavin mg/d	Niacin equivalent mg/d	Pyridoxine mg/d	Ascorbic acid mg/d	Dietary folate µg/d	Vit B µg/d	Magnesium mg/d	Zinc mg/d			
Man	Sedentary work	60	2320	60.0	25	600	17	600	4800	1.2	1.4	16	20	40	200	1.0	340	12			
	Moderate work		30		1.4					1.6	18										
	Heavy work		40		1.7					2.1	21										
Woman	Sedentary work	55	1900	55.0	20	600	21	600	4800	1.0	1.1	12	2.0	40	200	1.0	310	10			
	Moderate work		25		1.1					1.3	14										
	Heavy work		30		1.4					1.7	16										
	Pregnant woman		30		+0.2					+0.3	+2	2.5							500	1.2	60
	Lactation 0-6 m		30		+0.3					+0.4	+4	2.5							300	1.5	80
6-12 m	30	+0.2	+0.3	+3	2.5																
Infants	0-6 months	5.4	92 kcal/kg/d	1.16 g/kg/d	--	500	46 µg/kg/d		---	0.2	0.3	710 mg/kg	0.1				30	---			
	6-12 months	8.4	80 kcal/kg/d	1.69 g/kg/d	19		05	350	2800	0.3	0.4	650 mg/kg	0.4	25	25	0.2	45	---			
Children	1-3 years	12.9	1060	16.7	27		09	400	3200	0.5	0.6	8	0.9		80		50	5			
	4-6 years	18.0	1350	20.1	25	600	13	600	4800	0.7	0.8	11	0.9	40	100	0.2-1.0	70	7			
	7-9 years	25.1	1690	29.5	30		16			0.8	1.0	13	1.6		120		100	8			
Boys	10-12 years	34.3	2190	39.9	35	800	21	600	480	1.1	1.3	15	1.6	40			120	9			
Girls	10-12 years	35.0	2010	40.4	35	800	27	600	4800	1.0	1.2	13	1.6	40	140	0.2-1.0	160	9			
	13-15 years	47.6	2750	54.3	45	800	32	600	4800	1.4	1.6	16	2.0	40			165	11			
	13-15 years	46.6	2330	51.9	40	800	27	600	4800	1.2	1.4	14	2.0	40	150	0.2-1.0	210	11			
Boys	16-17 years	55.4	3020	61.5	50	800	28	600	4800	1.5	1.8	17	2.0	40			195	12			
	16-17 years	52.1	2440	55.5	35	800	26	600	4800	1.0	1.2	14	2.0	40	200	0.2-1.0	235	12			

Source : Recommended Dietary Allowances for Indians, ICMR, 2010.



**Review Exercise**

Meal	Menu	Ingredients	Amt (g)	Energy (Kcal)	Protein (Kcal)
Lunch	Rice	Rice	40		
	Chapati	Wheat Flour	60		
	Dal	Bengal Gram Dal	30		
	Brinjal Potato	Brinjal	80		
	Vegetable	Potato	40		
	Curd	Onion	30		
		Fat	5		
		Curd	125		

So then was that an easy exercise? Not really! You may have realized that using the Food Composition Tables is cumbersome, time-consuming and needlessly precise and that you may not have the time to calculate for each day, each meal the energy and nutrient composition of the food required to fulfill the dietary needs of individuals. To overcome this problem, an *Exchange List* was evolved. What is an exchange list? Let us find out next.

But first refer to Table 1.1 which presents the recommended dietary intakes for Indians. The table lists the RDI for several nutrients.

### 1.3 THE EXCHANGE LIST

An exchange list is a grouping of foods in which specified amounts of all the foods provide approximately equal amount of (the same amount) carbohydrate, protein and fat and hence, energy content. Specific foods within the group may vary slightly in nutritive value from the averages stated in the group. These differences in composition tend to cancel out because of the variety of foods selected from day to day. Thus any food within a given list can be substituted or exchanged for any other food in that list in the given quantities. We are already familiar with the categorization of foods into groups i.e. the energy-giving group, the body-building group and the protective group as highlighted here in Table 1.2. These groups or exchanges represent commonly measured or purchased unit of food or its multiples. These exchanges also limits food items to those in common usage.

**Table 1.2: The three food groups**

Food Groups	Food Items
Energy-giving (provides carbohydrates or fats)	Cereals Roots and Tubers, Sugar, Jaggery Fats and Oils
Body-building (provides proteins)	Milk Pulses Meat/Fish/Poultry/Egg
Protective/Regulatory (provides vitamins and minerals)	Green Leafy Vegetables Other Vegetables Fruits

Food exchange system allows one to choose a variety of foods from within a group with adequate nutrients. Thus the exchange list has brought about simplicity, flexibility and standardization into the selection of values of foods used in quantitative diets. The food exchange system is important in planning a nutritious diet. Essentially, the *Food Exchange System* allows variety to be introduced into the diets without altering the energy or the macronutrient contents. The exchange lists are especially useful in planning diets for metabolic diseases and are very useful in the management of obesity.

Let us then quickly review the steps involved in planning/developing an exchange list. This will help you plan meals using the exchange list.

#### 1.3.1 Steps in the Development of Exchange List

Given herewith are the steps, which when followed, will guide you in developing the exchange list.

- 1) An important first step in developing an exchange list is to group together similar foods. As mentioned above, when we group together similar food items so that each supplies a constant amount of a particular nutrient we call the group a *food exchange*. For example, in Table 1.2, cereals, roots and tubers, sugar, fats and oils are grouped under the energy-giving group or exchange. Similarly, we have listed the category fruits, green leafy vegetables as part of the protective/regulatory group/exchange.
- 2) The second important step in developing an exchange list is the standardization of serving or portion sizes. The portion sizes vary considerably in India. Idlis, dosas, chapattis and puris of different sizes in different states and in different households is a common scene. Despite this, some attempts have been made to define portion sizes.
- 3) The third step is to calculate the energy, carbohydrate, protein and fat content of one serving or portion size of the different dishes. This can be done by converting the cooked weight of one serving of a dish into raw weight of the ingredients that have gone into it. Although allowances should be made for cooking losses, this has not been done. Future exchange lists must take care of this. From the raw weights of the ingredients in one serving and using the Indian food composition Tables, the energy, carbohydrate, protein and fat content of one serving can be calculated.
- 4) The fourth step is to create an exchange list of different dishes in terms of standard portion sizes that would provide approximately the same energy or carbohydrate or fat as the case may be. Since foods contain widely varying amount of the macronutrients, serving or portion sizes are defined for a group of more or less homogeneous foods. For example, all cereals provide approximately the same number of calories, approximately 350 per 100 g raw weight and about the same amount of carbohydrates, about 70 g per 100 g raw weight (Refer to Table 1.3). Therefore, cereal exchanges are grouped together. Similarly, there are vegetable, fruits, milk and meat exchanges. Within each of these food groups, the composition of the different items in terms of carbohydrate, protein and fats remain similar.

**Table 1.3: Nutritive values used in the development of the exchange list for cereals**

Food Group	Energy (Kcal)	CHO (g)	Protein (g)	Fat (g)
Bajra	348	61.8	10.96	5.4
Jowar	334	67.7	9.9	1.7
Maize, dry	334	64.8	8.8	3.8
Ragi	320	66.8	7.2	1.9
Rice, raw	356	78.2	7.9	0.5
Parboiled	351	77.2	7.8	0.5
Flakes	354	76.5	7.4	1.9
Puffed	362	77.7	7.5	1.6
Whole wheat flour	320	64.2	10.3	1.5
Maida	352	74.3	10.4	0.8
Semolina	334	68.4	11.4	0.7
Vermicelli	333	70.4	9.7	0.4
<i>Mean</i>	<i>342</i>	<i>70.6</i>	<i>9.8</i>	<i>1.7</i>
Bread, White	265	49	9.0	3.2
Brown	293	54	11	3.3

Source: Indian Food Composition Tables, 2017

To help you understand the exchange list concept more clearly, we have included an example of a comprehensive exchange list developed by the Lady Irwin College, New Delhi. Refer to Table 1.4. As you may have noticed, the list consists of three exchange groups. These are energy-giving, body-building and protective/regulatory exchange. A brief review of these exchanges follows:

- Under the energy-giving exchange, cereal exchange per serving (20 g), provides 75 Kcals, 15 g carbohydrate and 2 g protein. Likewise the roots and tubers, sugar, fats and oil exchanges are defined (see Table 1.4).

**Table 1.4: Food exchanges**

Exchange (Food Group)	No. of Exchanges	Amount (g)	Energy		Protein (g)	Carbohydrate (g)	Fat (g)
			KJ	Kcal			
<b>(Energy Giving group)</b>							
Cereals	1	20	315	75	2	15	0.5
Roots and Tubers	1	100	210	50	1.5	10	Negligible
Sugar and Jaggery	1	6	84	20	Negligible	5	Negligible
Fats and Oils	1	5	190	45	Negligible	Negligible	5
Oilseeds	1	8-12	190	45	2.9	Negligible	5
<b>(Body-building group)</b>							
Milk	1	250	750	180	8	12	11
Skimmed Milk	1	320	390	94	8	15	Negligible
Pulses	1	30	420	100	7	17	Negligible
Meat/fish/poultry (Meat 1)	1	40	334	80	7	Negligible	5
(Meat 2)	1	40	146	35	7	Negligible	1
<b>(Protective/regulatory Group)</b>							
Green leafy vegetables	1	100	124	30	3	2.5	Negligible
Other vegetables	1	100-150	124	30	2	3.5	Negligible
Fruits	1	80-150	190	45	1	10	Negligible
Meat 1 : Egg, Hilsa, Chicken (skinless), Goat (chops, legs, brain), Sardines, Paneer							
Meat 2 : Egg white, Chicken (liver), Goat (Kidney, liver), Sheep (liver), Katla, Prawn, Rohu, Crab							

Source: Adapted from Technical Series 6, Compilation of Food Exchange List, 2017 developed by Lady Irwin College, University of Delhi.

- Within the body-building group, milk exchange provides per serving (250 ml) 180 Kcals, 12g carbohydrate, 8 g protein and 11g fat; meat exchange provides per serving (40 g) 80 Kcals and varying amounts of CHO, 7 g protein and 5 g fat.
- Under protective/regulatory group, fruit exchanges provide per serving (80 - 100 g) 45 Kcals and 10 g carbohydrate, the vegetable group exchange provides 30 Kcals.

Using the steps elaborated above, we hope you will be in a position to use the exchange system to calculate a diet pattern, which calculates the diet order in kinds and number of servings of food exchanges to be consumed by any individual or a patient each day.

Although the exchange system, you would have noticed, reflects average and not specific energy and nutrient values, the therapeutic success that results when the values are used to calculate the diet pattern demonstrate that the method is accurate enough to serve this purpose.

The exchange list described above, you may have realized, is a handy and simple tool to calculate therapeutic diets and balanced meals for individuals. It is important that you understand this concept very clearly here now, because we shall use this exchange list in planning diets for different disease conditions subsequently in this manual. To help you in this task, here we have included an exercise, which will provide you practical experience of using the exchange list given in Table 1.4 above for planning diets. Before you move to the exercise, we suggest you review the steps involved in planning diets.

## 1.4 STEPS IN PLANNING DIETS

As you go through the practical included in this manual, you will realize that in each activity, the steps involved in planning diet are the same. These steps have been highlighted here for your understanding and guidance.

### STEPS IN PLANNING DIETS

<p><b>Step I : Identify the individual and his/her Specific Characteristics</b></p> <ul style="list-style-type: none"> <li>● Age</li> <li>● Sex</li> <li>● Activity Level</li> <li>● Income</li> <li>● Socio-economic background</li> <li>● Religion</li> <li>● Region where residing</li> </ul>
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- Step II : Consult RDIs**  
**Step III : Decide on Total Exchanges for each Group**  
**Step IV : Decide on the Meal Pattern and Distribute the above Selected Exchanges according to the Meal Pattern**  
**Step V : Decide on the Menu**  
**Step VI : Select Appropriate Quantities for each Dish as per the Exchanges Available and Calculate the Nutrient Content for the Detailed Diet Plan.**  
**Step VII : Compare the Amount of the Nutrients Provided through the Detailed Menu Plan with the RDI.**

Now that you have a good insight about the exchange list and the steps involved in planning diets, let us help you understand this concept further with the help of an example. Here is an exercise related to planning a diet for an individual using the exchange table and the food composition table. The step by step procedure to be followed has been explained here in this activity. Follow the steps carefully as you go

about reading the exercise. Towards the end, you will have to undertake some basic calculations for calculating the nutrient content of the diet using the Food Composition Tables. So please have a copy of these Tables handy. This exercise will prepare and guide you for undertaking the other activities included in this manual.

## 1.5 REVIEW EXERCISE

**Activity:** Diet Planning Using the Exchange List and the Food Composition Table.

**Aim:** To plan a diet for an individual using the exchange list and the food composition table.

**Case Study:** Ramu is a sedentary adult man 25 years of age. He belongs to a middle income family living in North India. He is a vegetarian. Plan & calculate a day's diet for Ramu. Based on this case study or Ramu, we shall plan a diet using the steps elaborated in Section 1.4 above.

**Step I: Identify the individual and his/her specific characteristics**

From the case study of Ramu let us specify the characteristics as under:

**Age: 25 years**

**Sex: Male**

**Activity Level: Sedentary**

**Income: Middle income level**

**Region where residing: North India**

Now move on to step II i.e. find out the nutrient requirement for Ramu.

**Step II: Consult RDI for Energy and Protein**

(Hint: Ramu is an adult sedentary worker; hence look up the energy and protein requirement in Table 1.1 for adult man sedentary worker. Based on the RDI, Ramu's requirements are given in the format herewith).

### *RDA for Ramu*

Energy (Kcal)	Protein (g)
2320	60

Having calculated Ramu's energy and protein requirement and move on to step III.

**Step III: Decide on Total Exchange**

(So as to meet the RDI, select exchanges for each food group. Look at the exchange distribution given in the format herewith). This is one example you may distribute the exchanges differently so as the obtain 2320 Kcal and 60 g proteins.

Exchange	No.	Energy (Kcal)	Protein (g)
Cereal	14	1050	28
Roots and Tubers	2	100	3
Pulse	2	200	14
Milk and Milk products	2	360	16
Meat	–	–	–
Green leafy vegetables	1	30	3
Other vegetables	3	90	6
Fruit	3	135	3
Sugar	6	120	–
Fat	4	180	–
Oil Seed/ Nuts	1	45	2.9
<b>Total</b>		<b>2310 Kcal</b>	<b>76 gms</b>

Once the total exchange(s) are decided, we move to step IV.

**Step IV: Decide on the meal pattern and distribute the above selected exchanges according to the meal pattern.**

(Hint: Since Ramu is a sedentary worker, he is likely to have 3-4 meals/day as shown in the format herewith. The above selected exchanges can be distributed among these meals as shown in the format herewith)

Exchange	No.	Exchange for Day's Menu						
		Early Morning	Breakfast	Mid-Morning	Lunch	Tea	Dinner	Post Dinner
Cereal	14	–	4	1	4	1	4	–
Roots and Tubers	2	–	1/2	1/2	1/2	–	1/2	–
Pulse	2	–	1/2	–	1	1/2	–	–
Milk and Milk Products	2	1/4	1/2	–	1/2	1/4	–	1/2
Meat	–	–	–	–	–	–	–	–
Green leafy vegetables	1	–	1/2	–	1/2	–	–	–
Other vegetables	3	–	1	–	1	–	1	–
Fruit	3	–	–	2	–	–	–	1
Sugar	6	1	1	–	1.5	1	–	1.5
Fat	5	–	2	1/2	1	1/2	1	–
Oil seed/ Nuts	1	1	–	–	–	–	–	–

The distribution of exchange for a day's meal, you would realize, is useful in deciding the menu which is step V.

**Step V: Decide on the menu**

(Using the exchange available for each meal (as decided in step II) prepare a menu for Ramu by selecting the most appropriate foodstuffs).

**Menu for Ramu**

Early Morning	Breakfast	Mid-Morning	Lunch	Tea	Dinner	Post Dinner
Almond (4-5) (Before Tea) Tea + Biscuit	Paushtik Methi Roti (2) Curd/Milk	Masala Oats + Fruit	Salad Chapati Vegetable Dal Sweet Curd Mint Chutney	Stuffed Chilla Tea	Salad Chapati Vegetable Dal	Milk/Fruit Custard

The menu given above is one example. You may think or plan a different menu. Once the menu is ready, we can calculate the nutritive content of the meals included in the menu using the Food Composition Table. This is step VI.

**Step VI: Select appropriate quantities for each dish as per the exchanges available and calculate the energy and protein content for the detailed diet plan.**

(This is an exercise for you to perform. The appropriate quantity for each dish as per the exchange available is already given in the format given next. Complete the calculations using the food composition table).

Meal	Menu	Ingredient	Amt (g)	Exchange	Energy (Kcal)	Protein (g)
Early Morning	Almond Tea  Biscuit	Almond	8-10	1		
		Milk	50	1/4		
		Sugar	5	1		
		Biscuit	1-2	-		
Breakfast	Paushtik Methi Roti Curd/ Milk	Wheat Flour	80	4		
		Besan	10	½		
		Onion	50	½		
		Fenugreek leaves	50	½		
		Oil	10	2		
		Milk	150	½		
		Sugar	5	1		
Mid- Morning	Masala Oats  Fruit	Oats	30	1		
		Onion	25	1/4		
		Peas	25	1/4		
		Oil	2.5	½		
		Fruit	200	2		
Lunch	Salad Chapati Vegetable Dal Sweet Curd  Mint Chutney	(Cucumber, Carrot, Onion, Tomato)	50	½		
		Wheat Flour	80	4		
		Beans-Potato Veg	100	1		
		Dal	30	1		
		Curd	150	½		
		Sugar	7.5	1½		
		Oil	5	1		
		Mint leaves	50	½		
Tea	Stuffed Chilla Tea	Rice Flour	30	1		
		Besan	10	½		
		Milk	100	1/4		
		Sugar	5	1		
Dinner	Salad  Chapati Vegetable Dal	(Cucumber, Carrot, Onion Tomato)	50	½		
		Wheat Flour	80	4		
		Lady Finger	100	1		
		Dal	30	1		
		Oil	5	1		
Post Dinner	Fruit Custard	Milk	175ml	½		
		Sugar	7.5	1½		
		Fruit	100	1		
		Total				

Now, let us evaluate how good our plan is. Move to step VII.

**Step VII: Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed in the RDI.**

(Write the amount of nutrients provided through the detailed menu plan in the format given below : Compare them with the RDI. Give your suggestions for improvement).

Nutrient	Amount Computed from RDA	Amount Computed through diet	Suggestions for Improvement
Energy (Kcal)	2320		
Protein (g)	60		

Now that you have completed the exercise, we hope you have got a good insight into the concepts related to planning diets. Perhaps you may need to go through this practical once again before you move on to the other practical and the activities included in this manual. So go ahead revise this practical once again and then move on to Practical 2.



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## PRACTICAL 2 SPECIAL FEEDING METHODS

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### Structure

- 2.1 Introduction
- 2.1 Special Feeding Methods: An Overview
- 2.3 Enteral Nutrition: Benefits and Types
- 2.4 Enteral Nutrition: Nutrient Requirement
- 2.5 Blenderized Feeds/Home Blend Formulas

*Activity 1: Planning Home Blend Feeds*

*Activity 2: Survey for Commercial Enteral Feeds Available in the Indian Market*

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### 2.1 INTRODUCTION

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The goal of nutrition intervention is to supply adequate nutrients to meet the patient's nutrient requirement by the most physiologic, safety and cost effective route. Sometimes person cannot eat any or enough food because of an illness. The stomach or bowel may not be working quite right, or a person may have had surgery to remove part or all of these organs. Under those conditions, nutrition must be supplied in a different way i.e through enteral and parenteral route. In this practical we shall review these special feeding methods, with special focus on enteral nutrition. What are the benefits and indications for enteral nutrition? What are the enteral feeds and their characteristics? How to prepare home-based blenderized formulas? These are a few aspects covered in this practical.

#### Objectives

After undertaking this practical, you will be able to:

- differentiate between enteral and parenteral nutrition,
- indicate the conditions when special feeding is required,
- discuss the types of enteral feeds, and
- prepare blenderized feeds for patients.

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### 2.2 SPECIAL FEEDING METHODS: AN OVERVIEW

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Parenteral and enteral nutrition are the two special feeding methods for nutritional support to the critically ill individuals.

*Enteral Nutrition* is defined as *provision of nutrition support through the GI tract or by accessing the gut*. It also refers to feeding into the GI tract through a feeding tube. Enteral nutrition (EN) can be administered via *transoral* (oral ingestion of food), *transnasal* (administration of liquid feeds through feeding tube through the nose), or *percutaneous transgastric routes* (through stomach), or by a tube into the small intestine called a jejunostomy or percutaneous endoscopic jejunostomy (PEJ). Hence, enteral nutrition is often called tube feeding.

*Parenteral nutrition* is one another way by which critically ill patient receives food when they cannot eat. It is a special liquid food mixture given into the blood with a needle through a vein. The mixture contains all the protein, sugars, fat, vitamins, minerals and other nutrients needed. It is sometimes called *total parenteral nutrition* or *TPN*.



Here in this practical we will focus only on the enteral method of feeding. You may recall studying about these special feeding methods in the theory course (MFN-005) in Unit 4. Here we will recapitulate the salient characteristics and benefits of enteral nutrition and learn how to plan and prepare few simple blenderized enteral formulas/feeds.

So let us get started with the benefits and types of enteral nutrition.

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## 2.3 ENTERAL NUTRITION: BENEFITS AND TYPES

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It must be evident to you by now that, enteral nutrition is used when the gut is still partially working, but then patient cannot eat or absorb enough nutrients to stay healthy.

Some of the benefits of EN, therefore, include:

- it is easier to administer, present fewer metabolic and infectious complications,
- enteral access is easy, gut integrity and motility are preserved and the stress response is attenuated,
- it reduces the incidence of pathogen entry or bacterial translocation into the stomach cavity or circulation,
- it provides more complete nutrients, trace elements and short chain fatty acids, as well as, fibre, and
- it provides a trophic effect on the gut by promoting pancreatic and biliary secretion, as well as, endocrine, pancreatic and neural factors that help promote the physiological and immunologic integrity of the GI tract.

Other than the benefits, can you suggest what the conditions are when enteral feeding is indicated? You may recall studying about these conditions also in the theory course in sub-section 4.3.1. Patients with the following conditions may be more likely to need enteral feedings:

- Acquired immunodeficiency syndrome (AIDS)
- Burns
- Cancer
- Infections, prolonged
- Kidney problems
- Liver problems
- Lung problems
- Pancreas problems
- Stomach problems
- Surgery
- Trauma
- Vomiting, prolonged
- Malnutrition, malabsorption, failure to thrive (as in the case of children)

Once it has been decided that enteral feeding is the choice of special feeding method, next we need to plan what type of enteral feeds or formula needs to be given. You may recall studying about the polymeric, oligomeric, modular or blenderized formulas earlier in the theory course. These different types of enteral feeds with their salient features are presented here as well in Table 2.1 for your convenience.

**Table 2.1: Enteral feeds and their specific characteristics**

Enteral Feeds/formula	Specific Characteristics
<p><b><i>Polymeric formulas</i></b> (also called formula diets) This is the general purpose, most widely prescribed feed. It is the sole source of nutrition intake for critically ill individuals with or near normal GI function.</p>	<ul style="list-style-type: none"> <li>– Provide nitrogen as whole protein, often casein, egg white solids or soy protein.</li> <li>– Carbohydrate is provided as corn syrup, maltodextrins or glucose oligosaccharides, with sucrose added for sweetness in oral formulas.</li> <li>– Fat is usually provided as soy oil, although corn oil and safflower oil may be used. Medium-chain triglycerides (MCT oil) are rarely used.</li> </ul>
<p><b><i>Oligomeric formulas</i></b> (also called elemental or semi-elemental diets)  Oligomeric diets are predigested formulated to require minimal digestion by the gastrointestinal tract. In other words, these diets are “complete.”</p>	<ul style="list-style-type: none"> <li>– Most of these formulas provide enough protein, calories, water, electrolytes, minerals, vitamins and trace elements in 2 L/day for most “non-stressed” patients</li> <li>– Provide nitrogen as oligopeptides from partially hydrolyzed whole protein or as crystalline amino acids.</li> <li>– Carbohydrate tends to be provided as glucose oligosaccharides or glucose.</li> <li>– Fat is usually present in small quantities, enough to meet the requirement for linoleic acid (an essential fatty acid), which is about 2-4% of total calories. MCT oil is added to some formulas.</li> <li>– Oligomeric diets have been commercially promoted as ideal for patients with decreased bile output (cholestasis), pancreatic insufficiency and short bowel.</li> </ul>
<p><b><i>Modular formulas/feeds</i></b> (used when a particular component of the diet requires an increased intake or if a patient requires a special blend of diets)  These modules are not required for the majority of patients, and are rarely used.</p>	<ul style="list-style-type: none"> <li>– Modular formulas are those that contain or predominantly contain one kind of nutrient.</li> <li>– There are commercially available modules for protein, fat, carbohydrates, vitamins, electrolytes and trace elements.</li> </ul> <p>Examples of this might include burns or protein-losing enteropathy, if more protein is to be given, or renal disease, if less protein is to be given.</p>
<p><b><i>Blenderized Feeds</i></b> (For chronically ill patients with normal GI functions)</p>	<ul style="list-style-type: none"> <li>– Prepared by mixing the ingredients and delivered in an easily digestible form.</li> <li>– Provide carbohydrates, proteins and fat in the amount as in the balanced diet.</li> <li>– For long-term nutritional management.</li> <li>– Natural food items are used to prepare the feed.</li> </ul>

<p><b>Disease Specific Feeds</b> (these are specially formulated polymeric enteral feeds)</p>	<ul style="list-style-type: none"> <li>– For renal patients</li> <li>– For liver disease patients</li> </ul> <p>(specialized amino acid solutions have been made for use in special circumstances. For example, liver disease, renal disease and “stress,” such as trauma and sepsis. For liver disease, these solutions are composed mostly or exclusively of branched-chain amino acids, whereas for renal disease the solutions are predominantly essential amino acids).</p>
<p><b>Opportunistic Feeds</b> (with nutritional addition and substitution which are suggested to improve various aspects of organ function)</p>	<p>Addition and substitution include:</p> <ul style="list-style-type: none"> <li>– more middle chain triglycerides (MCT)</li> <li>– increased level of n-3 fatty acids, carnitine, beta carotene, RNA, arginine, glutamine etc.</li> </ul>
<p><b>Drink Feeds</b> (for those who cannot eat solid foods but can ingest liquid diets)</p>	<p>Nutritionally complete enteral feeds based on polymeric enteral diets Palatable</p>

Having gone through the types of enteral feeds, it is important to understand that functional status of the GI tract and absorptive capacity are the predominant factors in choosing a formula. Other considerations include: nutritional status/medical therapy, renal function, fluid tolerance/electrolyte balance, and route of delivery. Formulas are categorized according to their type and amount of protein and calories; some are tailored for different disease states. It is important that we have a thorough knowledge about these special formulas before being involved in the selection of formula and substitution of a product, if necessary. You would realize that different types of enteral formulas are commercially available for use with critically ill patients. Here, however, our focus will be to get a better insight into blenderized formulas which can be easily prepared at home. Let us review the blenderized feeds in greater details. But first, we shall study about the nutrient requirements of enteral nutrition.

## 2.4 ENTERAL NUTRITION: NUTRIENT REQUIREMENT

The nutrient requirement for an enteral formula is highlighted in Box 2.1. While planning for an enteral formula, it is important to note that the recommended dietary allowances serve as initial guidelines in the selection and modification of a formula. All nutrients of the final formula should be calculated and compared with RDA for age. Vitamin mineral supplementation may be needed.

<b>Box: 2.1</b>	<b>Enteral Formula Composition</b>
<ul style="list-style-type: none"> <li>– <i>Energy</i>: Most of the formulas provide 1.0 - 1.2 Kcal/ml. In high concentrations, they may provide 1.5-2.0 Kcal/ml and are used for patients who have elevated calorie needs (ranging from 30-35 Kcal/kg). Most individuals generally require a range of 25-35 Kcal/kg of body weight/day.</li> <li>– <i>Proteins</i> in enteral formulas provide 4% to 32% of total calories. Those formulas providing 18 to 32% of calories are considered high-protein solutions. Protein requirements (for adults) usually is 1g/kg body weight/day, with modifications</li> </ul>	

(seldom >1.5 g/kg body weight/day) to account for increased needs due to healing wounds, or acute or chronic disease. If a patient is malnourished, nutrient needs may be greater at first to restore nutritional status. Protein sources are provided as intact proteins (egg white solids), protein hydrolysates or crystalline amino acids. Predominate sources of protein include soy and casein.

- *Carbohydrates* contribute 40% to 90% of total calories in enteral formulas. Carbohydrate sources used in formulas are pureed fruits and vegetables, corn syrup solids, corn and tapioca starch hydrolysates, maltodextrins, sucrose, fructose and glucose.
- *Fats/Lipid* provides 1.5% to 55% of the total calories of enteral formulas. The principle source of fat includes vegetable oils, medium chain triglycerides (MCT), lecithin, and mono - and diglycerides.
- *Vitamins and minerals* are essential components of enteral formulas. They generally provides 100% of Recommended Dietary allowances (RDA). Different pathological conditions may require high or low amount of micronutrients.
- *Water* recommended:
  - Healthy adult: 1 ml/Kcal or 35 ml/kg body weight/day,
  - Healthy infant: 1.5 ml/Kcal or 150 ml/kg.
  - Elderly: consider 25 ml/kg with renal, liver, or cardiac failure; or consider 35 ml/kg if history of dehydration.
  - Normal tube feeding: 1 Kcal/ml; 80% to 85% water.

Let us understand the water recommendation with the help of an example. In case of a patient receiving 1500 Kcals, he/she would receive 1200 ml (80%) of water from the formula. If the patient weighs 60 kg, he needs an additional 700 ml of water each day.

- *Fiber* containing formulas are useful in patients requiring bowel management. Fiber can help manage diarrhoea by absorbing excess water from the stool, and can help manage constipation by providing bulk to the stool. Component of fiber is insoluble (cellulose, hemicellulose), or soluble fiber (pectin, mucilage, algal polysaccharide, gum). Soy polysaccharide is the fiber most often used in formulas and it contains 95% insoluble and 5% soluble fiber. Content of fiber-supplemented formula ranges from 5 to 15 g of fiber per liter. Recommended intake of dietary fiber is approximately 20 to 25 g / 1000 kcal (ICMR).

Now that we have a good knowledge about the different types of enteral feeds and their nutritive content, let us focus in greater details on blenderized feeds.

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## 2.5 BLENDERIZED FEEDS/HOME BLEND FORMULAS

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Many a times, you would realize that patient requests or is required to prepare tube feeding at home. Though this is possible and does have some benefits, there are some significant points to be considered when home blend formulas are prescribed to the patient. *Blenderized formulas* can be prepared from *ordinary foods of a normal diet* by using a *blender or hand mixers*. It is important to note that while preparing a blenderized formula, any “approved” food item should be completely blenderized

**Table 2.2: Advantages and disadvantages of home blenderized tube feeding**

Advantages	Disadvantages
Family can take an active part in food preparation for the patient	It requires more time and energy to prepare than commercial products
Less costly. Commercial preparations can be 10-50% more expensive	Special equipment is needed i.e. high-speed blender or food processor, measuring utensils, refrigerator etc.
Increased amount of fibre can be provided	Special care is to be taken to liquefy the content of the blender completely, as food particles can clog the feeding tube.
Sense of 'being different' is lessened since the patient can enjoy the same table food as his or her family	Feeds must be prepared daily
Manipulation of individual nutrients is easier as compared to commercial feeds	Daily ingredient selection should be carefully made to ensure nutrition adequacy of the feed.
Unpleasant taste is less likely to occur	May need vitamin and mineral supplementation
	Higher incidence of bacterial contamination may occur.
	Clean food preparation techniques must be emphasized

and then strained through a medium strainer before being instilled into the tube. Some of the advantages and disadvantages of home blend formulas are highlighted in Table 2.2.

**Table 2.3: Composition of Blenderized Tube-feeding Formulation: Pure Vegetarian**

Ingredients	Amount (g)	Calories		Protein (g)	CHO (g)	Fat (g)
		(Kcal)	(kJ)			
Rice	90	320	1340	7.0	70.4	0.4
Green gram dal	50	162	680	11.9	26.0	0.6
Bread	20	12.6	53	1.8	9.8	0.6
Milk	200 ml	146	610	6.5	9.9	9.0
Skimmed Milk Powder	75	270	1130	18.8	38.7	1.1
Spinach	50	12.2	51	1.1	1.0	0.3
Pumpkin	50	11.6	48.5	0.4	2.0	0.1
Carrots	50	19.1	80	0.5	3.4	0.2
Banana	70	77.4	324	0.9	17.5	0.2
Sugar	60	240	1008	-	60	-
Refined Oil	20	180	753	-	-	20
Butter	7	51	214	-	-	5.7
(Add Water to make 1500 ml)						
<b>Total</b>		1502	6284	50	238	38

**Table 2.4: Composition of Blenderized Tube-feeding Formulation: Vegetarian with Egg**

Ingredients	Amount (g)	Calories		Protein (g)	CHO (g)	Fat (g)
		(Kcal)	(kJ)			
Rice	90	320	1340	7.0	70.4	0.4
Green gram dal	50	162	680	11.9	26.0	0.6
Bread	20	12.6	53	1.8	9.8	0.6
Milk	200 ml	146	610	6.5	9.9	9.0
Skimmed Milk Powder	75	270	1130	18.8	38.7	1.1
Spinach	50	12.2	51	1.1	1.0	0.3
Pumpkin	50	11.6	48.5	0.4	2.0	0.1
Carrots	50	19.1	80	0.5	3.4	0.2
Banana	70	77.4	324	0.9	17.5	0.2
Sugar	45	180	753	-	45	-
Refined Oil	20	180	753	-	-	20
Butter	7	51	214	-	-	5.7
Egg	50	73.8	309	6.7	-	5.3
(Add Water to make 1500 ml)						
<b>Total</b>		1516	6342	56	223	43.3

**Table 2.5: Composition of Blenderized Tube-feeding Formulation: Non-Vegetarian**

Ingredients	Amount (g)	Calories		Protein (g)	CHO (g)	Fat (g)
		(Kcal)	(kJ)			
Rice	90	320	1340	7.0	70.4	0.4
Green gram dal	50	162	680	11.9	26.0	0.6
Bread	20	12.6	53	1.8	9.8	0.6
Milk	200 ml	146	610	6.5	9.9	9.0
Skimmed Milk Powder	75	270	1130	18.8	38.7	1.1
Spinach	50	12.2	51	1.1	1.0	0.3
Pumpkin	50	11.6	48.5	0.4	2.0	0.1
Carrots	50	19.1	80	0.5	3.4	0.2
Banana	70	77.4	324	0.9	17.5	0.2
Sugar	40	160	669	-	40	-
Refined Oil	20	180	753	-	-	20
Butter	7	51	214	-	-	5.7
Mutton	50	73.8	309	6.7	-	5.3
Egg	50	46.12	193	9.11	-	1.0
(Add Water to make 1500 ml)						
<b>Total</b>		1542	6452	65	218	44.3

Source: Adapted from Kawli A. Sreenivasan L. Eapen S, Pradhan S.A. Diet for cancer patients – tube-feeding formulations. Indian J. Cancer 1982; 19: 226-30.

Based on these examples, in the same manner you can plan and prepare blenderized feeds. To help you in understanding the concept better, we have included two activities in this practical. Go ahead read the case studies and carry out the activities as suggested.

**PLANNING HOME BLEND FEEDS**

To help you get a better understanding on blenderized feeds, here are few examples of home blend formulas, which you can easily plan and prepare at home.

Date :

**Aim** : To plan and prepare a home blend feed for a patient recovering from a stomach problem.

**Case Study** : Devi is 38 year old cancer patient who is suffering from malnutrition postoperatively. She weighs 45 kg and is 5ft and 4 inch in height. She has been suggested a special enteral feed. Plan and prepare a home blend feed suitable for her condition.

Based on the case study carry out the activity following the instructions given herewith.

**Introduction**

(Briefly elaborate on Devi's disease condition and the need and benefits of blenderized feed in the space provided herewith).



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**Step I**

(Read the case study carefully and identify the important points that may determine nutrient intake/diet planning. Identify specific disease characteristics. Based on the risk factors, comment on the patient's profile).

***Patient/Case Profile***

Age:

Gender:

Activity pattern:

Weight:

Height:

BMI:

Diet recommended:

Medical problem:

**Based on the patients profile, list the general considerations you will keep in mind while planning the feed in the space provided herewith:**

**Step II: Assessment of the nutritional needs of the patient.**

(In the format given herewith, present the recommended dietary intake for Devi. Refer to section 2.4 for calculating the modified RDA for Devi. Work out your calculations for reaching the modified RDI and record those in the space provided herewith. Compare her requirement with the requirement of a sedentary healthy female).

**Recommended Dietary Intake for 24 hours**

<b>Nutrients</b>	<b>Normal RDA for Sedentary Female</b>	<b>Modified RDA for Devi</b>
Calories (Kcal)		
Proteins (g)		
Carbohydrates (g)		
Fat (g)		
Fluids (ml)		

**Calculations :**



**Step III: Based on the modified RDA, now plan a home blend feed for Devi in the format given herewith:**

*Name of the Home Blend Feed:*

*Ingredients required for preparing the Home Blend Feed*

(Write the composition, quantity and cost of the feed in the format given herewith).

<b>Ingredients</b>	<b>Amount</b>	<b>Cost</b>
<b>Total</b>		

**Step IV: Calculate the nutritive content of the home blend feed**

(Calculate the nutritive content of the feed in the format given herewith).

<b>Ingredients</b>	<b>Amt (g)</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Fat (g)</b>	<b>Carbohydrate (g)</b>
<b>Total</b>					
<i>Nutritive Content per 100 g</i>					
<i>Nutrient Content per ml</i>					

**Step V: Plan the feeding schedule most suitable for the patient**

(Present the schedule in the space provided herewith. *Hint:* You may present information regarding the timings for giving the feed, total serving per day, serving size etc.).

*Serving Size:*

*Total Serving per Day:*

*Timing for Feeding:*

**Step VI: Evaluate the home blend feed**

(Prepare the feed and evaluate based on the parameters given in the format).

Parameter	Description of Parameter	Suggestions for Improvement
Appearance		
Smell		
Overall taste		
Sweetness		
After Taste		
Nutritive Content		

**Submit your activity for evaluation.**

\_\_\_\_\_  
**Counselor's Signature**

## SURVEY FOR COMMERCIAL ENTERAL FEEDS AVAILABLE IN THE MARKET

### ACTIVITY

# 2

**Aim** : To carry out a survey in the local market to identify commercial enteral feeds available in India.

Date :

**Survey** : Carry out a survey in your region (local market, chemist shop, hospital pharmacy etc.) to identify the various types of commercial enteral feeds available in your region. Present the special characteristics, composition and the nutritive content of any five enteral feeds identified by you in the format given herewith.

Begin the activity with an overview on the enteral feeds.

### Introduction

(Present a brief write-up on enteral feeds, their benefits, types and when indicated in the space provided herewith),

### Survey Result

(Present the survey results for any *five commercial enteral feeds* in the format given herewith).

### Enteral feed

Enteral Feed (Name and Type)	Composition	Nutritive Content	Indicative for which Disease Condition	Cost

Enteral feed (Name and Type)	Composition	Nutritive Content	Indicative for which Disease Condition	Cost

**Conclusion**

(Comment on the cost and availability of the commercial feeds available in the market in the space provided herewith).

**Submit your activity for evaluation.**

---

**Counselor's Signature**

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# PRACTICAL 3 NUTRITIONAL MANAGEMENT OF FEVERS

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## Structure

- 3.1 Introduction
- 3.2 Fevers: An Overview
- 3.3 Different Types of Fever
  - 3.3.1 Acute Fever
  - 3.3.2 Chronic Fever
  - 3.3.3 Fevers of Unexplained Origin
- 3.4 Impact of Fever on Nutritional Status
- 3.5 Management of Fevers
  - 3.5.1 Principles of Dietary Management
- 3.6 Review Exercises

*Activity 1: Diet Plan for Typhoid*

*Activity 2: Diet Plan for Tuberculosis*

---

## 3.1 INTRODUCTION

---

Fever is a symptom and not a disease itself. It is a response to stress, trauma or altered immune/metabolic system of the body. Since fever can develop in association with several forms of trauma, communicable/non-communicable diseases; dietary modifications may be required keeping in mind the nutritional demands imposed by fever and other associated diseases. Therefore, in this practical, we shall learn about the nutritional implications of fever and the dietary management of different types of fevers. We have already studied about fevers and their management in the Clinical and Therapeutic Nutrition Theory Course (MFN-005) in Unit 3. We suggest you look up the unit once again and refresh your knowledge before you get down to this practical and the activities included in this practical.

### Objectives

After undertaking this practical, you will be able to:

- describe the different types of fevers,
- explain the impact of fever on the nutritional status,
- discuss the dietary management of different types of fevers, and
- plan diets for patients suffering from typhoid and tuberculosis.

---

## 3.2 FEVERS: AN OVERVIEW

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The average normal oral body temperature (taken in the mid-morning is) 36.7°C (range 36.0°C–37.4°C). This includes mean and  $\pm 2$  standard deviations, thus encompassing 95% of normal population. The normal rectal or vaginal temperature is 0.5°C higher than the oral temperature and the auxiliary temperature is correspondingly lower. Rectal temperature is more reliable than oral temperature. The normal diurnal

temperature variation is 0.5–1.0°C, being lowest in the early morning and highest in the evening. There is a slight sustained temperature rise following ovulation, during the menstrual cycle, and in the first trimester of pregnancy.

Thus, fever is a regulated rise to a new “set point” of body temperature. The elevation in temperature results from:

- Increased heat production (e.g. shivering)
- Decreased loss of heat (e.g. peripheral vaso-constriction).

The maximum of increase in body temperature has been outlined in Figure 3.1.

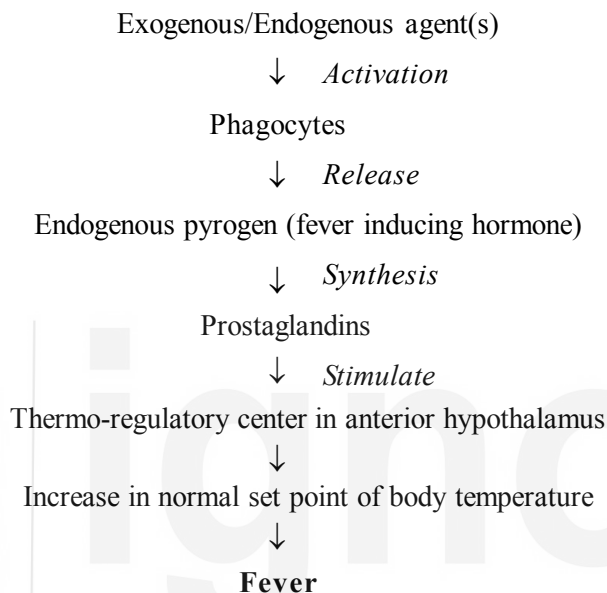


Figure 3.1: Mechanism of increase in body temperature

Let us now brief ourselves on the various forms of fever and the common terms associated with fever.

### 3.3 DIFFERENT TYPES OF FEVER

Several forms of fever have been identified; most of them being a symptom of an underlying disease. The most common forms of fever occur in association with infections, autoimmune disorders, central nervous system and malignant diseases. Several cardiovascular and gastrointestinal diseases are also associated with fever. Depending upon the duration and severity of rise in body temperature, fevers can be classified as *acute* and *chronic*. Let us briefly recapitulate.

#### 3.3.1 Acute Fever

Most febrile illnesses are due to common infections and are short lived. Acute fevers are of short duration but the body temperature may rise to even above 104°F. Fevers associated with common infections such as *typhoid*, *tonsillitis*, *influenza*, *chickenpox*, *pneumonia* and certain *parasitic infestations* are acute in nature. A brief review on typhoid follows:

##### Typhoid – An Acute Fever

**Causative agent:** *Salmonella typhosa*

**Salient features/Symptoms:**

- Slow (stepladder) rise in fever to maximum (plateau in 7-10 days)
- Reese spots (pink puple 2-3 mm in diameter) on trunk
- Sore throat and cough
- Headache

- Malaise
- Pea-soup diarrhoea or marked constipation
- Leukopenia (abnormally low WBC count)
- Bradycardia (a slow heart rate)
- Splenomegaly (enlargement of spleen)
- Complications: thrombophlebitis, (inflammation of a vein associated with blood clot), nephritis (inflammation of kidneys), cholecystitis (inflammation of gall bladder) etc.

**Diagnostic tests:**

- Blood, stool and urine cultures

**Treatment:**

- Drugs (Ampicillin, chloramphenicol, trimethoprim-sulfamethoxazole)
- Dietary management
- Bed rest and keeping the patient warm.

### 3.3.2 Chronic Fever

These are characterized by elevated body temperatures over a period of three weeks or even for several months. The temperature usually does not rise above 33°C (average). *Tuberculosis* and *HIV/AIDS* are the most common forms of fever due to infection. Chronic fevers are also seen in association with stress, chronic gastrointestinal diseases, cancer and severe malnutrition. A brief review on tuberculosis follows:

#### Tuberculosis – A Chronic Fever

**Causative agent:** *Mycobacterium tuberculi*

**Salient features/symptoms:**

- Cough with expectoration
- Fatigue
- Unintentional weight loss
- Coughing up blood
- Fever (usually below 39°C) and night sweats
- Wheezing, difficulty in breathing
- Chest [pain tuberculin lesions in the infection organ (haemorrhages, bleeding)]
- Gastric disorders (anorexia, diarrhoea)

**Diagnostic tests:**

- Sputum cultures
- Tuberculin skin test
- Chest X-ray
- Bronchoscopy
- Thoracentesis
- CT scan (lungs, kidney, heart, other organs)
- Biopsy or affected tissues

**Treatment:**

- Drugs (Isoniazid, Rifampin, Pyrazinamide, Ethambutol, Streptomycin)
- Dietary Management
- Bed rest and rehabilitations (if required)

### 3.3.3 Fevers of Unexplained Origin

Unexplained cases of fever exceeding 38.3°C on several occasions for at least 3 weeks in patients without neutropenia or immunosuppression are referred to as “fevers of unknown origin” (FUO). FUO are most commonly associated with *AIDS*, *mycobacterium avium infection*, *pneumocystis carinii pneumonia*, *cytomegalovirus infection*, *lymphoma* and *disseminated histoplasmosis*.

Having looked at the different types of fevers, next let us briefly recapitulate the impact of fever on nutritional status, since this will influence the dietary management of fevers.

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## 3.4 IMPACT OF FEVER ON NUTRITIONAL STATUS

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Irrespective of the cause, a rise in body temperature above normal (37°C) results in several metabolic changes in the body. These changes in nutritional status occur in proportion to the severity of elevation in body temperature, as well as, the duration of fever. The following changes occur in the metabolic and nutritional status of an individual during fever.

- Elevation of body temperature results in an increase in basal metabolic rate. The BMR increases by nearly 13% for every 1°C rise in body temperature.
- Since fevers are associated with anorexia on one hand and increased energy expenditure due to elevated BMR on the other; they result in depleted reserves of glycogen and adipose tissues.
- Negative energy balance over a prolonged duration results in breakdown of tissue/muscle proteins as alternative sources of energy. Enhanced protein catabolism results in increased load on kidneys for the excretion of nitrogenous waste products.
- Risk of dehydration increases due to sweating associated with fever and also due to the enhanced urine output – a response initiated by the kidneys to excrete nitrogenous wastes.
- Due to enhanced sweating, urination and at times, diarrhoea/vomiting, there are also enhanced losses of several electrolytes particularly sodium, potassium and chloride.
- The intake, as well as, absorption of nutrients is low thereby increasing the chances for the development of deficiency diseases.
- Depleted reserves of both macro- and micronutrients results in loss of weight and increased susceptibility to subsequent infections.
- High temperature during the first trimester of pregnancy may cause birth defects, such as anencephaly.
- Fever also increases insulin requirements and alters the metabolism and disposition of drugs used for the treatment of the diverse diseases associated with fever.

So then fevers can have a profound impact on the metabolism and the nutritional status. What then is the treatment of fevers? Let us find out.

---

## 3.5 MANAGEMENT OF FEVERS

---

The management of fevers is based on the following measures:

- Dietary management
- Measures for removal of body heat
- Treatment of etiological factor(s)
- Medications such as antipyretic drugs and anti-microbial therapy

Here we shall focus only on the dietary management.



### 3.5.1 Principles of Dietary Management

You must be very well aware of the fact that fever imposes nutritional demands on the body. The requirements for nutrients increases in direct proportion to the rise in temperature, as well as, duration. In our subsequent discussion, we shall learn about the various principles of dietary management for acute (typhoid) and chronic (tuberculosis) fevers.

#### A) Dietary Management – Typhoid

In view of the clinical characteristics of typhoid fever and its impact on the nutritional status of the patient; the following objectives of dietary management must be kept in mind:

- to promote and maintain a positive energy and nitrogen balance,
- to replenish the depleted reserves of all nutrients,
- to prevent further damage and promote healing of Peyer's patches (any of the several lymph nodes in the walls of the intestine), and
- to provide rest and maintain an optimum nutritional status.

The various aspects of dietary management which can help in promoting and maintaining a good nutritional status of the patient during typhoid and also prevent the development of complications, are presented next. We will start with the requirements for energy and then proceed for other nutrients.

*Energy:* During typhoid, there is a peak rise (as high as 104°F) in the body temperature during the first phase (7-10 days) followed by a plateau and then a decline. The BMR also increases in proportion to the elevation of body temperature which results in loss of muscle and fat mass as alternative sources of energy. Thus, the diet should provide enough calories to prevent the onset of negative energy balance. Most of the non-ambulatory patients benefit by increasing the energy intake by 10-20% above the RDI.

*Protein:* A high protein intake which provides 1.5-2.0 g protein/kg body weight/day is recommended during and immediately after the recovery from infection to reduce the risk for reoccurrence. During the active phase of typhoid there is massive destruction of body tissues to release energy (food intake being low). A high protein diet is also required to ensure rapid healing of peyers patches. High biological value proteins such as milk/milk products, eggs, meat, marine foods, chicken, pulses and legumes should be included in liberal amounts. If the patient is on a full fluid diet, good amount of milk and beaten eggs can be included. However, if diarrhoea/abdominal distension is severe, milk intake may need to be restricted.

*Carbohydrates:* Nearly 60% of the total energy should be provided from carbohydrates. The type of carbohydrates included should be easy to digest i.e. foods rich in mono and disaccharides, as well as, starches should be included in liberal amounts. The intake of plant polysaccharides in the form of dietary fibre should be kept to a minimum as they increase gastric discomfort, are difficult to digest and reduce the nutrient density of meals. Foods rich in simple/easy to digest carbohydrates include semolina, rice, chirwa, murmura, refined flour, sago, arrowroot, starchy roots/tubers, jaggery sugar, honey, dextrose fruits such as banana, mango, sapota, grapes etc. The patient's diet can include dishes such as upma/poha/dalia/khichdi with vegetables and sprouts, stewed fruits with honey, fruit cream custard, pureed vegetables and pulses, vegetable soup with cream/butter, potato dumplings, roasted yam/potato, ice-cream, puddings, souffle, etc. Raw foods (fruits and vegetables) should be avoided.

*Fluids:* Liberal intake of fluids to compensate for the losses from sweat and to permit adequate volume of urine for excreting the nitrogenous waste products is important. The patient should therefore be given plenty of mechanically, chemically and thermally

bland clear fluids and full-fluids such as kanji, lemon water, fruit juices, soup, coconut water/milk, squashes (without citric acid), sugarcane juice, high energy glucose/electrolyte drinks, whey water, buttermilk, lassi, soya milk, milk shakes etc.

*Vitamins:* In view of infection, gastrointestinal disturbances etc., the requirements for vitamin A, vitamin C and B-group vitamins increases. Apart from including plenty of well-cooked fruits and vegetables; employing special measures such as cooking food in red-palm-oil, incorporating spirulina, curry leaves, amla, lemon (squash/murabba) can help in improving the vitamin content of meals.

*Minerals:* Although the requirement for all minerals increases but that of calcium, phosphorus, iron, sodium, potassium and chloride are particularly high. Incorporating liberal amounts of milk/whole milk products, green leafy vegetables (particularly Bengal gram leaves), chirwa, jaggery and a variety of fruits can help in increasing the mineral content of diet. If there is severe diarrhoea and/or there has been considerable amount of sweating during the progressive phase of typhoid; oral rehydration therapy (ORS) and high mineral beverages should be initiated.

We will now quickly brief ourselves on the important aspects of meal planning (when and how to provide the above discussed nutrients to the patient). Improper meal timings/inappropriate selection of foods, cooking methods or mode of feeding can be a determined factor in the outcome of the disease. Hence, few special considerations are highlighted herewith:

#### *Special Considerations*

- High energy, high protein, bland diet, moderate in fat and fibre with plenty of fluids should be given to the patient.
- During the first 2-3 days when the fever is very high and/or inflammation of peyer's patches is severe, a full-fluid diet followed by a semi-soft diet needs to be given. Full-fluids (soups, juices, coconut milk/water, egg nog, milk based beverages etc.) may be given at every 2-2<sup>1/2</sup> hour, interval throughout the day.
- The diet should be chemically, mechanically and thermally non-irritating. Therefore, avoid the use of spices/condiments, raw fruits, salads, improperly cooked whole cereal grains and whole pulses. Strongly flavoured foods, as well as, very hot and very cold food should be avoided (ice-cream, frozen desserts, very hot beverages- kava, tea, coffee, soup.)
- Most of the patients remain anorexic during and even after recovery from typhoid. It is, therefore, important that the dietician attempts to stimulate interest in the meals by creating variety in terms of colour, texture, taste and mouthfeel. This is particularly important for paediatric patients. Wherein meals should be served attractively such as sprinkling crushed orange/strawberry flavoured sugar candy on beaten curd, incorporating leafy vegetables in cutlets (baked), roti, burfi etc., using jam/honey toppings on desserts, fruits, milk shakes etc. preparing sandwiches in different shapes etc.
- Isolated proteins such as soya, casein, whey can be sprinkled/ mixed with already prepared/ ready-to-serve dishes. Commercially available high energy high protein supplements such as complan, horlicks, build-up etc. can also be given. Enteral feed formulas may be used if the gastrointestinal functions are severely impaired.

With a brief review on typhoid, let us now study about the dietary management of tuberculosis, which we learnt, is a chronic type of fever.

## B) Dietary Management – Tuberculosis

Keeping the clinical implications and impact of tuberculosis on nutritional status in mind, let us identify and outline the objectives of dietary management.

### *Objectives of Dietary Management*

The objectives of dietary management of tuberculosis is:

- to create positive energy and nitrogen balance,
- to help in replenishing the depleted nutritional reserves,
- to maintain an optimum nutritional status during the period for treatment, and
- to accelerate recovery and help in proper rehabilitation of the patient.

We can meet the above objectives by making suitable modifications in the nutrient intake and food choices of the patient. There may also be a need to bring about changes in the behaviour/ life-style (if required). Subsequent discussions will be focused on dietary/nutritional modifications and diet pattern. Let us begin by reviewing the nutrient requirements during tuberculosis.

*Energy:* Patients suffering from tuberculosis are generally malnourished and underweight. Increased energy expenditure due to elevated basal metabolic rate, recurrent cough, anorexia, gastrointestinal disturbances and respiratory discomfort result in a negative energy balance which leads to weight loss. Thus, energy intake through diet should be increased to achieve and maintain weight gain. The energy intake should be increased by at least 5-10% if the temperature is about 39°C. Alternatively, we can increase the energy intake by about 500 Kcal above the usual food intake/RDI to promote weight gain. A very enthusiastic approach towards increasing the calorie intake is not helpful as it may only precipitate gastrointestinal discomfort.

*Protein:* There is considerable wasting of body tissues during chronic fevers because they are utilized as alternative sources of energy. Majority of the patients have low muscle mass and depleted serum protein levels. Patients benefit by taking 1.2 to 1.5 g protein per kg body weight per day. Proteins of high biological value such as those present in milk, curd, yoghurt, khoa, meat, chicken, fish and other marine food, pulses and legumes can be taken in good amounts. However, if the patient belongs to low-income group, it is important to counsel him/her regarding cheap sources of protein such as incorporating milk, curd, Bengal gram, peas (seasonal) in their diet. Adopting sprouting, fermentation and combination of cereals with pulses or milk etc. can help in improving the quality and bio-availability of meals.

*Fat:* Fat intake should remain normal (20% to 25% of total energy as recommended for a non-tuberculosis healthy adult/child). Emphasis should be laid on invisible, medium chain triglycerides and emulsified fat if the patient is suffering from gastric discomfort. Fried foods and high-fat snacks (poories, bhatooras, pakoras, kachories, samosas etc.) need to be avoided. Including some amount of fat helps to ensure adequate intake of fat-soluble vitamins and also make the meals nutrient dense/palatable.

*Carbohydrate:* Around 60% of the total energy should be provided from carbohydrates to promote positive energy balance (to ensure weight gain) and spare the proteins for anabolic processes. A combination of simple and complex carbohydrates should be included, but care should be taken that the diet contains moderate amount of fibre in a soft cooked form. Thus, whole cereals such as jowar, bajra, cracked wheat, oats should be softened/cooked well (serve bajra kheer, cracked wheat porridge, bajra/cracked wheat, khichdi etc.).

*Minerals:* Majority of TB patients are chronically under nourished and suffer from deficiencies of several minerals. Good amounts of milk/milk products and whole cereal/ pulse products should be included to provide adequate amount of calcium and

phosphorus. This is essential for the healing of tuberculin lesions and also to replenish depleted reserves of calcium. Iron deficiency due to poor absorption, iron deficient diet and/or haemorrhages is also frequently observed. Economical measures such as sugar with jaggery, consuming good amounts of seasonal fruits and vegetables, lotus stem (dry), chirwa (flattened rice), jowar, bajra, roasted Bengal gram, lentils, animal foods, particularly liver (haem iron) can help in improving the iron status of the patient.

*Vitamins:* Patients suffering from tuberculosis generally have depleted levels of all water and fat soluble vitamins. In order to ensure adequate absorption of calcium and in view of the impaired conversion of  $\beta$ -carotene to retinol, the diet should provide good amounts of vitamin D and A, respectively. Therefore, we should include liberal quantity of milk/milk products and some amount of animal food (eggs, meat etc.). Among the water-soluble vitamins; folic acid, vitamin B<sub>6</sub> and ascorbic acid should be provided by including liberal amounts of seasonally available fresh vegetables and fruits.

*Fluids :* During the progressive phase of tuberculosis when the body temperature may be around 39°C, there is considerable breakdown of muscle tissues. This tends to increase the workload on kidney's for excreting high amounts of nitrogenous waste products. Thus, the patient should consume more than 1.5 litres of water everyday. The fluid intake should be particularly high if they are also suffering from diarrhoea.

#### *Other Special Considerations*

- Small, frequent, nutrient dense and easy to digest meals should be given during tuberculosis.
- During the acute phase (progressive tuberculosis), a semi-soft or soft diet is recommended (khichdi, kheer, boiled/mashed/pureed vegetables and/or fruits, yoghurt etc.). A regular diet is suggested during the recovery phase. Indoor patients suffering from severe pulmonary tuberculosis may need to be given a full-fluid diet which can be supplemented with high energy, high protein enteral feeds.
- Meal pattern should be adjusted according to work schedule of the patient. It has generally been observed that several ambulatory patients (particularly sweepers, carpenters, construction workers, rickshaw pullers) follow a 2 or maximum a 3 meal pattern. They should be encouraged to consume meal more frequently and advised regarding the concept of carrying easy to digest, nutrient dense, non-perishable food-items such as paranthas stuffed with sprouts, missi roti, dhokla, vegetable poha/upma/dal with sprouts/panjiri, besan laddoo etc.
- Majority of the patients (particularly LIG) suffering from tuberculosis have limited purchasing power. They should therefore be counseled effectively regarding the low-cost nutritious foods available in their region such as red palm oil, spirulina, Bengal gram leaves, lotus-stem, dates, guava, jaggery, jowar, bajra, chirwa, milk and milk products (prepared at home-curd etc.). They should also be made to understand the benefits and process of sprouting/fermentation and combining cereals with protein rich foods. Preservation of seasonal vegetables such as drying of raddish leaves/curry leaves, pickling etc. may also be advocated.
- To ensure proper rehabilitating and prevent reoccurrence, the patient should be convinced and encouraged to:
  - consume drugs (medicines) as per the schedule,
  - avoid residing in areas with poor hygiene/sanitation conditions, and
  - avoid smoking and spitting bulgum on roads/public places and rooms in his/ or house.

So far we have discussed about the important aspects of diet planning and life-style modifications during acute and chronic fever(s). You should now make an attempt to answer the questions mentioned in review exercises and self-check your progress. If you are able to complete the exercise satisfactorily; proceed ahead and carry out the activity 1 and 2 given herewith. Through these activities you will learn how to plan diet(s) for patients suffering from tuberculosis/typhoid.

### **3.6 REVIEW EXERCISES**

1) “Typhoid is an acute enteric fever”. Elaborate upon this statement.

.....

.....

.....

.....

2) What is the significance of giving micronutrient rich meals to a patient suffering from typhoid?

.....

.....

.....

.....

3) Enlist a few useful tips that can help to encourage an increased food intake by paediatric patients having typhoid infection.

.....

.....

.....

.....

4) Give two examples each of the breakfast menu, mid morning and evening snacks for typhoid patients.

<b>Breakfast</b>	<b>Mid Morning</b>	<b>Evening</b>
I)		
II)		

5) Define the term “chronic fever” in relevance to tuberculosis.

.....  
.....  
.....  
.....

6) The requirement of which vitamin(s) increases during long-term cases of tuberculosis?

.....  
.....  
.....  
.....

Now, move on to the activities given next.



## DIET PLAN FOR TYPHOID

**Aim** : To plan a diet for a patient suffering from typhoid.

Date :

**Case Study** : Charu is an 11 year old girl studying in Kendriya Vidyalaya and has come to the OPD complaining of fever for the past 6 days. The fever has been gradually increasing and today it is 103°F. The elevated temperature has remained almost constant since yesterday. Medical examination has indicated mild bradycardia (slow heart beat), splenomegaly (enlargement of the spleen) along with abdominal distension and tenderness. She has been complaining of headache, sore throat and cough. Blood, urine and stool cultures are positive for *Salmonella typhi* and she has been diagnosed to be suffering from diarrhoea. She has been prescribed drugs (trimethoprim-sulfamethoxazole). Her medical history reports a poor resistance to infection. She has been advised to consume a high energy, high protein micronutrient rich diet and also lay emphasis upon the incorporation of iron rich foods as her blood haemoglobin levels are low (10.1 gm%).

Based on this case study, now carry out the activity following the instructions given herewith. Start with the Introduction.

### Introduction

(Comment what type of fever (infection) is Charu suffering from? Briefly describe the salient characteristic features of this fever. Also identify the key nutrients for which the nutritional demands may have increased/decreased).

	Nutrient	Requirements		Reasons
		Increased	Decreased	
1)				
2)				
3)				
4)				
5)				

Now, move on to step I.

### Step I

Identify the salient features of the case which may play an important role in planning the diet/meals. So, read the case carefully and fill in the patient details in the format given below.

#### *Patient /Case Profile*

Name:

Age:

Gender:

Activity:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

#### *Clinical Profile*

*Patient Value*

*Normal Value*

Body temperature (F)

Haemoglobin (g%)

Based upon your understanding regarding typhoid (acute fever) and the details mentioned in the case, identify the various goals of dietary modifications and enlist them in terms of their priority in ascending order herewith.

#### *Objectives of dietary management*

—  
—  
—  
—  
—  
—

### Step II

Next, assess/calculate the nutritional needs of Charu and compare them with the RDI for a 11 year old girl (Refer to RDI table given in Practical 1). You may want to read the principles of dietary management for typhoid (sub-section 3.5.1) once again for a quick recapitulation.

#### **Recommended Dietary Intake**

<b>Nutrients</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (gm)		
Fat (g)		
Carbohydrate (g)		
Vitamin A (µg)		
Iron (mg)		
Vitamins C (mg)		



**Calculations:**

(Write the calculations for the modified nutrient intake in the space provided herewith).

**Step III**

On the basis of RDI, carefully select the food exchanges and list them in the format given herewith, that can help in maintaining a good nutritional status for Charu.

Exchange	No.	Energy (Kcal)	Protein(g)	Carbohydrates (g)	Fat (g)
Milk					
Meat					
Pulse					
Cereal					
Roots/Tubers					
Other Vegetable					
Green Leafy Vegetales					
Fruit					
Sugar					
Fat					

**Step IV**

In view of the symptoms being experienced by Charu and her nutritional requirements, identify an appropriate meal pattern and distribute the exchanges for providing balanced nutrition throughout the day. You may add or remove a meal from the meal pattern mentioned below.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	Post Dinner
Whole Milk								
Meat								
Pulse								
Cereal								
Roots/Tubers								
Other Vegetable								
Green Leafy Vegetales								
Fruit								
Sugar								
Fat								

### **Step V**

Now plan a day's menu for Charu in accordance with the exchanges available for each meal. Remember to include dishes/ingredients which are nutrient dense and easy to digest (refer to sub-section 3.5.1).

#### **Menu for Charu**

*Early Morning*

*Evening Tea*

*Breakfast*

*Dinner*

*Mid Morning*

*Post Dinner*

*Lunch*





### Conclusions

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

Nutrient	Modified RDI	Detailed Diet Plan	$\pm$ % of Difference	Suggested for Improved Intake
Energy (Kcal)				
Protein (g)				
Iron (mg)				
Vitamin A (IU)				
Vitamin C (mg)				

Submit the activity for evaluation.

---

Counselor's Signature

## DIET PLAN FOR TUBERCULOSIS

**Aim** : To plan a diet for a patient suffering from tuberculosis.

Date :

**Case Study** : Mrs. Dayawati is a 34 year old sweeper residing in an urban slum. Of late she has been experiencing fatigue, weight loss, fever ( $33^{\circ}\text{C}$ ), sweating at night and recurrent cough with massive expectoration. She was therefore advised to take help from a nearby district hospital. Her chest radiograph is indicative of pulmonary infiltrates and the tuberculin skin test reaction is positive. Acid-fast bacilli has been identified on the smear of sputum and the culture has been found to be positive for mycobacterium tuberculosis. At present she has been prescribed drugs (isoniazid, rifampin and pyrazinamide) for a period of 3 months (under DOT) and would be required to get hospitalized, if her condition does not improve.

Now based on this case study, carry out the activity following the instructions given herewith.

### Introduction

(In the space provided herewith, describe the clinical condition which Dayawati is suffering from).

Identify any four nutrients, the nutritional requirements of which may change due to her disease condition.

	Nutrient	Intake Increase/Decrease	Reason
1)			
2)			
3)			
4)			
5)			
6)			

Now, based on this information, proceed towards planning a diet for Dayawati.

### Step I : Patient's Profile

As per the details given in the case, fill the patient profile in the format given below.

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Socio-economic status:

Pathophysiological stress:

Dietary habits:

Diet prescribed:

Next, identify the key objectives of dietary management. This can be done easily by reading the case and the principles of dietary management (presented in sub-section 3.5.1B) earlier. List the objectives in the space provided herewith.

#### *Objectives*

—  
—  
—  
—  
—

### Step II

Next, assess/calculate the nutritional requirements of Dayawati which can help her in maintaining a good health status and compare them with the RDI (Refer to Table 1.1 in Practical 1) (ICMR) for an healthy adult woman (moderately active).

#### **Recommended Dietary Intake**

<b>Nutrients</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (gm)		
Calcium (mg)		
Iron (mg)		
Folic acid (mg)		

#### **Calculations:**

(Give the calculations in the space provided herewith).

### Step III

Select most appropriate food exchanges that can help in providing nutrient as per the modified RDI. Write down the exchanges in the format given herewith.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrates (g)	Fat (g)
Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
Green Leafy Vegetables					
Fruit					
Sugar					
Fat					

(Note: Incorporate adequate amounts of cereals and sugar).

### Step IV

Identify an appropriate meal pattern for Dayawati with regards to her clinical profile/ activity/ work pattern and time available for preparing food. (You may add or remove a meal from the meal pattern mentioned below.) Now distribute the exchanges selected above for preparing meals throughout the day.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	Post Dinner
Meat								
Pulse								
Cereal								
Roots/Tubers								
Other Vegetables								
Green Leafy Vegetables								
Fruit								
Sugar								
Fat								

### Step V

Plan a day's menu for Dayawati by using the exchanges available for each meal. Remember that Dayawati belongs to low income group. Plan meals which are nutrient dense, easy to digest, economical and easy to prepare. Her mid-morning snack and lunch should be easy to carry.

**Menu for Dayawati**

*Early Morning*

*Lunch*

*Breakfast*

*Evening Tea*

*Mid Morning*

*Dinner*

**Step VI: Detailed menu plan**

(Give the detailed menu plan in the format given herewith).

<b>Meal</b>	<b>Menu</b>	<b>Ingredient</b>	<b>Amount (g)</b>	<b>Exchange</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Iron (mg)</b>	<b>Folic Acid (mg)</b>	<b>Calcium (mg)</b>



Meal	Menu	Ingredient	Amount (g)	Exchange	Energy (Kcal)	Protein (g)	Iron (mg)	Folic Acid (mg)	Calcium (mg)
<b>Total</b>									

### Conclusions

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

Nutrient	Modified RDI	Detailed Diet Plan	± % of Difference	Suggested for Improved Intake
Energy (Kcal)				
Protein (g)				
Iron (mg)				
Calcium (mg)				
Folic Acid (mg)				

*Give a few behaviour/life-style modification tips to Dayawati which can help her in recovering fast/prevent subsequent development of complications.*

**Submit the activity for evaluation.**

\_\_\_\_\_  
Counselor's Signature

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# PRACTICAL 4 NUTRITIONAL CARE OF WEIGHT MANAGEMENT

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## Structure

- 4.1 Introduction
- 4.2 Introduction to Weight Management
- 4.3 Weight Imbalance
- 4.4 Methods of Assessment
  - 4.4.1 Visual Inspection
  - 4.4.2 Standard Weight and Height Measures
  - 4.4.3 Skin-Fold Thickness
  - 4.4.4 Circumference Measurement
- 4.5 Principles of Diet Planning
  - 4.5.1 Principles of Diet Planning – Overweight/ Obesity
  - 4.5.2 Principles of Diet Planning – Underweight
- 4.6 Review Exercises

*Activity 1:* Diet Plan for Overweight Obese Individuals

*Activity 2:* Diet Plan for Underweight Individuals

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## 4.1 INTRODUCTION

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In view of the rapidity with which traditional diets and life-styles are changing in many developing countries, it is not surprising that food insecurity and undernutrition persist in the same countries where chronic diseases are emerging as major public health problems. The epidemic of obesity with its attendant co-morbidities – heart disease, hypertension, stroke and diabetes – is not a problem limited to industrialized countries. Inability to gain weight/achieve and maintain an ideal (normal) body weight is a big public health issue which needs to be addressed to, especially in view of its association with IUGR (intrauterine growth retardation), low birth weight and hence an intra-generational increased risk for the development of chronic degenerative diseases and early mortality.

Thus, in this practical, we shall learn about the various practical aspects of weight management. We shall begin with a briefing on the various components of weight which shall be followed by different forms of weight imbalance.

We will also learn about the various methods which a dietitian can employ for quick evaluation/assessment of overweight/underweight. The various principles of dietary/life-style management will be followed by a few review exercises and planning of diet(s) to help you in learning/improving your skills pertaining to the overall assessment and management of under/overweight conditions in a spectrum of physiological/clinical situations.

### Objectives

After undertaking this practical, you will be able to:

- discuss the components of body weight and the concept of weight management,
- describe the conditions linked with weight imbalance,
- explain the methods of assessment of weight imbalance,
- elaborate on the principles of dietary management for the weight imbalance conditions, and
- plan diets for obese and underweight individuals.

## 4.2 INTRODUCTION TO WEIGHT MANAGEMENT

Body weight, as we all know, is the sum of bone, muscle, organs, body fluids and adipose tissue. Some or all of these components are subject to normal change as a reflection of growth, reproductive status, variation in exercise levels and the effects of ageing. Achievement/maintenance of an ideal/normal body weight involves a complex interaction of several physiological (normal, hormonal and chemical) and/or environmental (dietary and life-style) factors. Alterations in the above mentioned factors causes changes in the body weight components and hence fluctuations in the weight of a person.

Thus, before we proceed to learn in-depth about the various aspects of weight management, let us clearly understand the various components which contribute to the total body weight of an individual. This information shall help us in understanding the inter-relationship between nutrient intake and physical actually vis-à-vis body composition.

### Components of Body Weight

Body weight is often described in terms of its composition. According to the most commonly used “two-compartment model”, body weight is comprised of two parts namely:

- i) Fat-free mass (FFM)
  - ii) Fat mass
- i) *Fat-free Mass* literally means tissue devoid of all extractable fat. It is very frequently used in close association with the term . “Lean body Mass” which includes parts of the body free of adipose tissue i.e. skeletal muscles, water, bone and a small amount of essential fat in the internal organs, bone marrow and nerve tissues. FFM is higher in men than in women, increases with exercise, is lower in older adults and is a major determinant of the resting metabolic rate.
  - ii) *Fat Mass*, which is a critical factor for weight management, can be categorized as either “essential” or “storage”. Essential fat, which is necessary for normal physiologic functioning, is stored in small amounts in the bone marrow, heart, lung, liver, spleen, kidneys, muscles and lipid-rich tissues in the nervous system. Nearly 3% and 12% of the total body fat is considered to be essential among men and women, respectively. The range of total body fat (essential fat plus storage fat) associated with optimum health is 8% to 24% in men and 21% to 35% among women.

Mentioned in Box 4.1 is the Behnke’s Theoretical Body Composition Model which gives normal ranges of various body components for men and women.

Box 4.1 Behnke’s Theoretical Body Composition Model		
Body Components	Males	Females
Total fat	8% - 24%	21% - 5%
a) Storage fat	5% - 21%	9% - 23%
b) Essential fat	3%	12%
Muscle	44.8%	38%
Bone	14.9%	12%
Remainder	16.3% - 32.3%	15% - 29%

Source : Am J Clin Nutr 72: 694, 2000.

## 4.3 WEIGHT IMBALANCE

A specific weight can be maintained throughout life if we can attain a balance between our energy intake and energy expenditure.

In the Theory Course (MFN-004) in Unit 2, you may recall studying about the two major forms of weight imbalance i.e.

- underweight (caused by chronic energy deficiency), and
- overweight/obesity

*Underweight* is a condition when the body weight is 10-20% less than the average expected for one's height, age and sex. If the body weight is less by 20% or more than ideal body weight (IBW), the individual is grossly underweight.

*Overweight* i.e. excessive accumulation of storage fat is a condition when an individual's body weight is 10-20% in excess of ideal body weight. However, when the body weight is 20% above the ideal body weight, it is termed as *obesity*.

While planning diets for helping a patient to increase or decrease weight we need to know his/her body composition/extent of weight imbalance. Assessment of body composition though more accurate, is an expensive method for identifying 'at-risk' individuals. In clinical settings, especially for out-door and non-critical patients, we need to employ methods which are easy-to-perform, quick and yield accurate results. In the subsequent section, we will discuss the various tools/techniques that can be employed for assessing the severity of weight imbalance in an individual.

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## 4.4 METHODS OF ASSESSMENT

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Underweight and obesity/overweight can be assessed in a variety of ways, depending on the necessity for accuracy and availability of required resources. The most common ones are as follows:

### 4.4.1 Visual Inspection

This is the simplest method of assessing whether an individual is lean/thin or overweight. This can also be used for identifying the type of obesity i.e. *android* or *gynoid*. For instance, when the trunk to hip ratio is more, the body shape resembles that of an apple. This type of obesity (*android obesity*) is more common in men and it increases the pre-disposition to cardiovascular diseases, hypertension, diabetes, stroke, respiratory disorders etc. On the other hand, if the trunk to hip ratio is low, the body shape resembles that of a pear and it is termed as *gynoid obesity*. It is more common among women.

### 4.4.2 Standard Weight and Height Measures

Basic anthropometric data i.e. weight and height can be most valuable indications of under/over nutrition especially if recorded over a period of time. The patients weight and height data can be utilized in the following ways:

- a) Comparison of the patient's present weight and height with the data given by Life Insurance Corporation of India. It is based on life expectancy data. (Refer to theory course MFN-005, Unit-9, Table 9.3).
- b) Computing the *ideal body weight* of the patient and comparing with *actual body weight*. This can be done by using the HAMWI method, which is as follows:

Females: 100 lbs (45.5 kg) for the first 5 feet + 5 lb (2.3 kg) for each additional inch ( $\pm 10\%$  for small/ large built).

Males: 106 lbs (48.0 kg) for the first 5 feet + 6 lb (2.7 kg) for each additional inch ( $\pm 10\%$  for small/large build)

For example, we can calculate the ideal body weight of a medium built man with height 5ft 4" inches as follows:

48.0 kg for first five feet +  $2.7 \times 4$  kg (2.7 kg for each additional inch)

i.e. 48.0 kg + 10.8 kg = 58.8 kgs.

Thus, the ideal body weight of the referred man is 58.8 kgs.

The actual body weight of the patient should then be compared with his ideal body weight to interpret the level of obesity/under weight as mentioned in Table 4.1.

**Table 4.1: Computing the ideal body weight in comparison with actual body weight**

Present Body Weight	Categorization/Interpretation
≥ 20% above IBW	Obese
< 20% to > 10% above IBW	Overweight
<10% above to < 10% below IBW	Normal weight
> 10% to 20% below IBW	Underweight
≥ 20% below IBW	Severely/ grossly underweight

- c) Comparison of *the actual/present body weight with usual body weight*. This is a useful parameter for critically ill/ hospitalized patients especially to indicate weight loss (if any). Comparison of present and usual body weight helps to assess immediate/recent changes in the weight status. Weight loss (lbs/kgs) reflects an immediate inability to meet nutritional requirements and thus may indicate nutritional risk. The percentage of weight loss is highly indicative of the extent and severity of an individual's illness. It can be classified as follows:

Significant Weight Loss	5% loss in 1 month, 7.5% loss in 3 months, 10% loss in 6 months.
Severe Weight Loss	> 5% loss in 1 month, > 7.5% loss in 3 months, >10% weight loss in 6 months
The minimum necessary actual body weight required for survival is 48% to 55% of usual body weight.	

- d) Calculating the *Body Mass Index* and comparing with standards. The Quetlet's Index ( $W/H^2$ ), the most widely used height weight index, is commonly referred to as Body Mass Index (BMI) and is a validated measure of nutritional status. It is a *measure of relative body fitness* and can be computed by using weight (kgs); (minimal clothing) and height (metres, without shoes).

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

The computed BMI can then be used to identify the level of under/over nutrition on the basis of the WHO classification as given in Table 4.2 and Table 4.3.

**Table 4.2: Weight status according to BMI**

Classification	BMI (kg/m <sup>2</sup> )	
	International	Asian
Underweight	<18.5	< 18.5
Normal	18.5-24.9	18.5-22.9
Overweight	25.0 - 29.9	23.0-24.9
Obese	≥30	≥25
Obese (Grade I)	30-34.9	
Obese (Grade II)	35.0-39.9	
Obese (Grade III)	> 40	

\*Source: WHO, 2004

**Table 4.3: FAO/WHO classification for chronic energy deficiency and/or underweight**

Chronic Energy Deficiency Grade (FAO)	Underweight Grade (WHO)	BMI(kg/m <sup>2</sup> )
Normal	Normal	> 18.5
Grade I	Mild Underweight	17.0 - 18.4
Grade II	Moderate Underweight	16.0 - 16.9
Grade III	Severe Underweight	< 16.0

BMI can also be assessed quickly by using the Bray's Nomogram as illustrated in Figure 4.1.

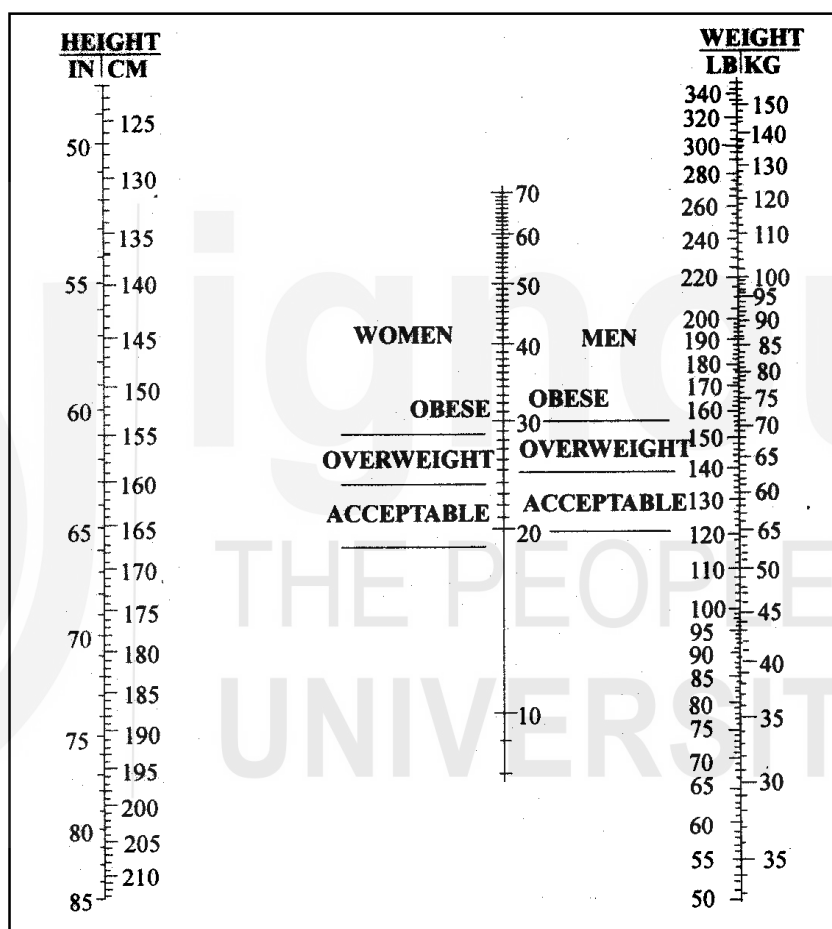


Figure 4.1: Nomogram for body mass index

#### 4.4.3 Skin-Fold Thickness

The skin-fold or fat-fold thickness measurement is a means of assessing the amount of body fat in an individual. The skin fold sites identified as most reflective of body fatness are:

- over the triceps and the biceps
- below the scapula
- above the iliac crest (suprailiac)
- upper thigh

Refer to Figure 4.2 which illustrates some of the skin fold measurements. Normal sub-cutaneous fat is about 11% and 18% of the total body weight in men and women, respectively. Refer to Table 4.4 for checking any abnormal values for tricep skinfold.

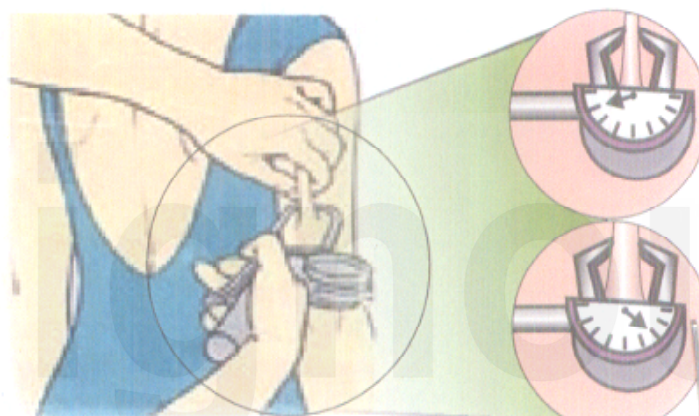
**Table 4.4: Percentile tricep skinfold measurements**

Percentile				
	Men		Women	
	55-65 y	65-75 y	55-65 y	65-75 y
Tricep skinfold (mm)				
10 <sup>th</sup>	6	6	16	14
50 <sup>th</sup>	11	11	25	24
95 <sup>th</sup>	22	22	22	36

Tricep skinfold > 95th percentile



Measurement of the subscapular skin-fold thickness



Skin-fold callipers measuring the thickness of subcutaneous fat (in millimeters)

Figure 4.2: Skin fold measurements

#### 4.4.4 Circumference Measurement

In recognition of the fact that fat distribution is an indicator of risk for several diseases; circumferential or girth measurement are used more frequently today. The presence of excess body fat around the abdomen out of proportion to total body fat is considered a risk factor for diseases associated with obesity/ metabolic syndrome. Most common circumference measurements are:

- *Waist and hip circumference*: Waist is measured around the navel. Hip is measured around its broadest part. A measurement of waist greater than 40 inches (100 cm) for men and greater than 35 inches (90 cm) for women are independent risk factors for disease when out of proportion to total body fat. *Waist to hip ratio (WHR)* serves as an important tool to assess the type of obesity. A WHR of >1.0 for men and >0.85 for women is an indicator of abdominal obesity.
- *Mid-arm circumference (MAC)*: Combining MAC with TSF (tricep skin fold) measurements allows indirect determination of the arm muscle area (AMA) and arm fat area (AFA). The AMA, or bone free muscle area, is a good indication of lean body mass and thus an individual's skeletal protein reserves. Refer to Figure 4.3 and 4.4 which illustrates the arm anthropometry for children and adults, respectively. Using this graph, you can measure the fat area and/or the muscle area.

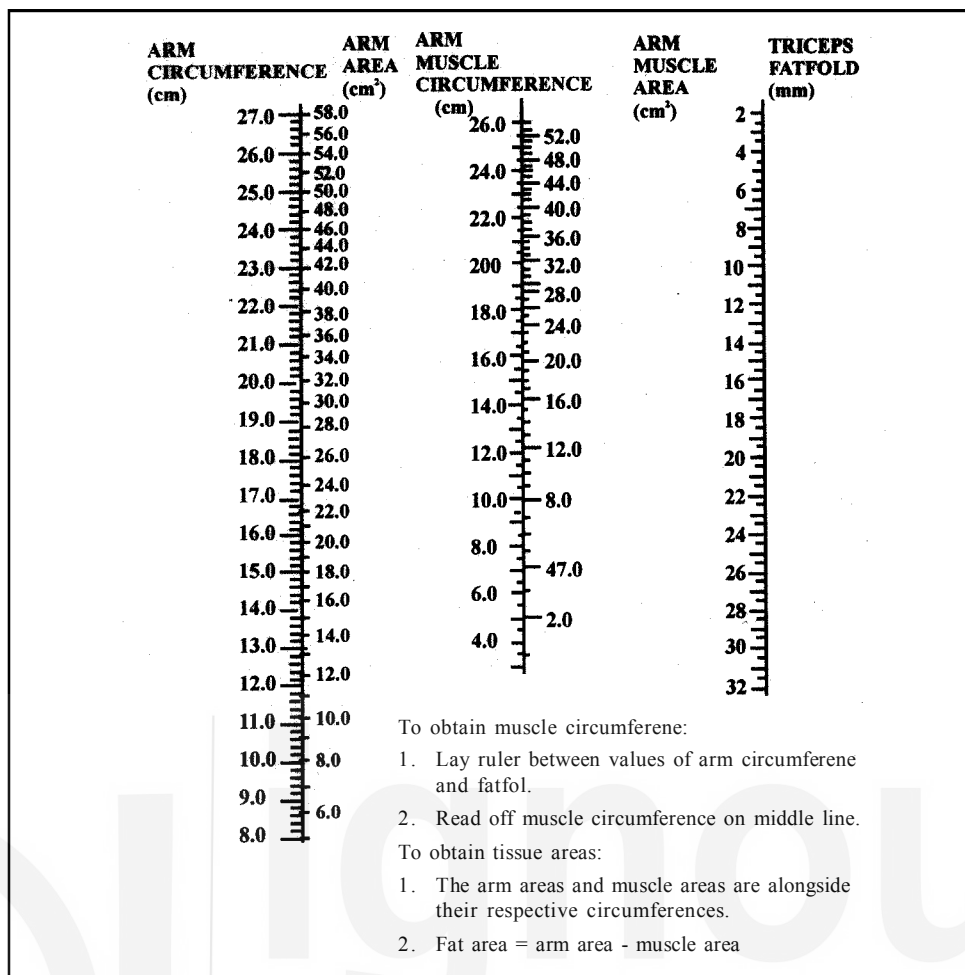


Figure 4.3: Arm anthropometry for children

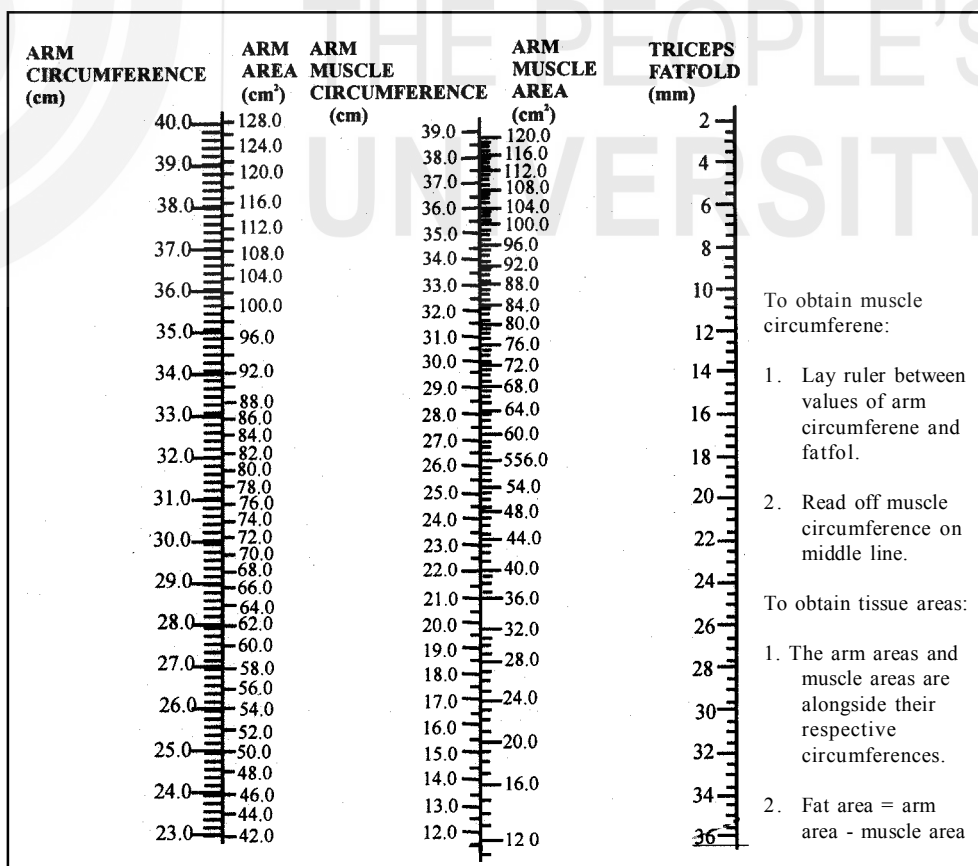


Figure 4.4: Arm anthropometry for adults



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## 4.5 PRINCIPLES OF DIET PLANNING

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We shall now discuss in detail the overall dietary and life-style modifications that can help an individual/patient in attaining and maintaining a desirable body weight. Let us first begin with our discussions on dietary management of overweight/obesity.

### 4.5.1 Principles of Diet Planning – Overweight/Obesity

There is convincing evidence that a high intake of energy-dense foods and/or sedentary life style promote weight gain. Although it is well known that diets high in non-starch polysaccharides, proteins and micronutrients can help in achieving and maintaining an ideal body weight; yet we all come across several overweight/obese patients who have tried to reduce weight by adopting formula diets/meal replacement programmes etc. Drastic weight reduction causes weakness and alterations in metabolic processes. Severe calorie restrictions/non-diet approaches do not help in maintaining the weight loss.

In this sub-section we shall learn about the various essential features of weight reduction diets. As a dietitian our objective should be to help the patient reduce weight gradually without suffering from muscle loss or micronutrient deficiencies.

#### *Objectives of Diet Planning*

The objectives of diet planning for overweight patients include:

- to promote gradual weight reduction,
- to prevent muscle loss and other nutritional deficiencies,
- to help in maintaining a desirable body weight, and
- to bring positive behavioural changes (diet/life style management).

In order to fulfill the above objectives, we need to bring about following nutritional modifications.

*Energy:* There is convincing evidence that a high intake of energy coupled with a sedentary life-style results in a positive energy balance which leads to excessive weight gain over a period of time. Thus, the energy intake needs to be reduced to promote weight loss. It is advisable to reduce weight at the rate of 0.5 to 1.0 kg a week for which we need to restrict the calorie intake by 500 Kcal to 1000 Kcal per day, respectively. The amount of energy restriction as per the rate of weight loss can be calculated as follows:

- 1 gram of dietary fat provides 9 Kcal
- 1 gram of body fat (adipose tissues) provide 7.7 Kcal.
- Therefore, a 500 gram of weight reduction would be equivalent to  $500 \times 7.7$  Kcal i.e. 3,850 Kcal.
- Thus, to facilitate  $\frac{1}{2}$  kg (500 g) weight loss in a week, we need to reduce energy intake by 3850 divided by 7 i.e. 550 Kcal/day from the RDI or usual dietary intake.

Similarly, if we want to reduce 1 kg (1000 Kcal) in a week (7 days) we need to reduce energy intake by  $3850 + 3850 = 7,700$  Kcal divided by 7 = 1,100 Kcal/day the RDI or usual dietary intake.

However, the energy intake should never be restricted to less than 1000-1200 Kcal for women and 1500-1800 Kcal for men as drastic calorie restrictions may cause weakness, deficiency of several nutrients, nervous exhaustion and disturbances in various metabolic processes.

Thus, the energy intake for an overweight/obese patient can be computed by two methods:

- i) Reducing around 500 Kcal/day from the usual dietary intake if the patient is overweight (weight loss rate = ½ kg per week) and 750 Kcal to 1000 Kcal/day from the usual dietary intake if the patient is obese (weight loss rate = 1 kg per week).
- ii) Calculating the energy intake based upon the activity and ideal body weight of the patient by using the values of kilocalories prescribed per Kg IBW for obese individuals as indicated in Table 4.5.

**Table 4.5: Daily energy requirements based on body weight and activity**

<b>Energy Requirements (Kcal/kg Ideal Body Weight/day)</b>			
<b>Activity</b>	<b>Obese</b>	<b>Normal</b>	<b>Underweight</b>
Sedentary	20-25	30	35
Moderate	30	35	40
Heavy	35	40	45-50

*Protein:* Around 20% of the total energy (modified) should be provided by proteins. Providing adequate amount of proteins helps in:

- preventing muscle loss and hence weakness,
- providing satiety patients have a longer intestinal transit time as compared to simple carbohydrates),
- maintaining a good nutritional status, and
- delaying/preventing the onset of complications associated with obesity (due to high intake of fat/refined carbohydrates i.e. heart diseases, diabetes, hypertension etc.)

Good quality proteins rich food sources which are low in saturated fat/cholesterol such as low-fat milk/their products (yoghurt, curd, paneer), egg white, lean meats (marine foods, chicken), pulses and legumes should be included in the diet. High fat-protein foods such as red meats (cow, buffalo, pork etc.), egg yolk and processed cheese should be avoided. Incorporating sprouted pulses in sandwiches, rotis, salads, soup, pulao are good options for increasing the protein content of meals.

*Fat:* The diet should not provide more than 20% of the total energy from fat. The total fat intake comprises of both visible and invisible fat (refer to Box 4.2) Conscious efforts must be made by the patient to restrict the intake of cooking fat, as well as, that present inherently in foods. *Food sources of invisible fat* (particularly saturated fat) such as red meats, egg yolks, nuts, oilseeds, margarine, certain bread spreads, bakery products should be completely restricted. The *visible fat intake* can be curtailed by avoiding fried food, using non-stick cookware/ micro-wave or cooking food by roasting, grilling and baking (dry heat). Butter, cream, pure ghee should be avoided and vegetable oils rich in MUFA's/PUFA's (low in SFA's) such as olive, safflower, corn, sunflower should be used in limited amounts. The dietary cholesterol intake should be kept below 300 mg/dl if the patient is not suffering from any heart disease. However, hyperlipidemic obese patients may benefit by lowering the dietary cholesterol intake to < 200 mg/day.

**Box 4.2 Visible and Invisible Fat**

Total Fat (g) = Invisible Fat (g) + Visible Fat (g)  
(as per modified RDI)

For planning diets, the visible fat allowance can be computed as follows:

Total fat (g) – Invisible fat (g) = Visible fat allowance for the day.  
(as per modified RDI)

*Carbohydrates:* Around 55-60% of the total energy should be provided by carbohydrates. However, emphasis should be laid on the consumption of foods rich in non-starch polysaccharides. This is so because dietary fibre rich foods have a longer intestinal- transit time and hence a higher satiety value as compared to foods rich in simple carbohydrates. For instance, a bowl of salad (sprouts + vegetables) will provide a higher satiety as compared to soup prepared from the same. Obese individuals should prefer to consume whole grains/their products, whole pulses/pulses with husk (rajmah, soyabean, horsegram, Bengal gram, whole moong, whole urad, cowpea) raw vegetables and fruits (preferably with their edible peels) as compared to refined cereals (rice, chirwa, suji, maida)/ their products (bread, pastas, biscuits etc.) washed pulses, starchy roots and tubers which are low in dietary fibre. Sugar, jaggery, honey, maple syrup, sugar candies, chocolates etc. should be strictly restricted.

*Minerals and Vitamins:* A weight reduction diet, if well planned, can provide adequate amount of all vitamins and minerals. Obese individuals should be encouraged to consume liberal amounts of raw non-starch vegetables and good amounts of low-calorie fruits preferably with their edible peels (raddish, cucumber, severely restricted in fat several months as in case of Grade III obesity; the patient may be at risk of developing deficiencies of fat-soluble vitamins. Thus, care must be taken to ensure adequate intake of vitamin E (green leafy vegetables, almonds etc.),  $\beta$ -carotene (yellow and orange coloured fruits/vegetables) and vitamin D (sunlight, oils fortified with vitamin A/D). Incorporating fermented foods and sprouted pulses/legumes can help in improving the bioavailability of several nutrients.

*Alcohol:* Alcohol consumption should be completely restricted as it contributes towards the total calorie intake in the diet. Further, alcoholic beverages are frequently consumed along with snacks (such as namkeens, pakoras, kabeb's, cutlets etc.) which are rich in fats and carbohydrates. If consumed for social reasons, the patient should be advised to take a small serving which is diluted with a liberal amount of drinking soda/water.

*Exercise and Lifestyle:* Physical activity and physical fitness are important determinants of morbidity and mortality related to over-weight/obesity. Exercise (particularly a combination of aerobic and resistance trainings) should be an integral part of the weight reduction regime.

According to FAO/WHO (2004), preventing weight gain after substantial weight loss probably requires 60-90 minutes of moderate intensity exercise per day. A total of one hour per day of moderate intensity activity, such as walking everyday is required to maintain a particular stable weight for individuals with sedentary life-style.

While the above mentioned principles of dietary/lifestyle management can help in reducing weight, it is important to bring about behavioural modifications so that a desirable body weight can be maintained throughout life. Effective patient counseling sessions during and after weight reduction can help in preventing the "YO-YO effect" of repeated episodes of weight gain/loss. Here are a few useful tips.

### Patient Counseling Tips

- Low Fat/fat-free milk and their products (cottage cheese, yoghurt, curd etc.) should be preferred over whole milk/ its products. Some amounts of milk should be consumed regularly to prevent bone loss frequently associated with weight loss.
- Whole cereals, whole pulses, pulses with husk and legumes should be preferred over low fibre cereals such as refined flour, semolina, rice, chirwa, pastas, breads etc.
- Low fat, white or lean meats should be preferred over red/high fat meats. Avoid animal foods such as egg yolk, lamb, goat, pork, cow and buffalo meat.
- Liberal servings of low calorie fruits and vegetables should be consumed everyday. It is advisable to start meals with a bowl of salad (raw vegetables and sprouted pulses) and end meals with a serving of low-carbohydrate fruit.  
Low calorie vegetables: leafy vegetables, tomato, cucumber, raddish, cabbage, turnip, ridge gourd, beans etc.
- Low calorie fruits: water/musk melon, orange, mausambi, loquat, lime, apple, pear etc.
- Cooking oil to be used sparingly. Olive, corn, rice bran and safflower are good options and can be used in rotation to maintain the n-3/ n-6 ratio. Dry heat methods of cooking such as roasting, grilling, sautéing on non-stick cookware and microwave can help in reducing the amount of oil used for cooking food.
- Sugar, honey, jaggery, sugarcane, maple syrup should be completely avoided. Desserts and sweet meats prepared by using artificial sweeteners may be taken occasionally if they are low in fat. Indian sweets such as gulabjamun, jalebis should be completely avoided. Low fat ice-cream/frozen desserts, soufflés, puddings may be taken in small amounts.
- “Khaties”, kachories, muthias, namakparas and most bakery products (cake, pasties, biscuits) contain high amount of fat particularly hydrogenated fat. They should not be consumed.
- Both nibbling and binging on food should be avoided.
- Roasted/puffed whole cereals/ pulses/ legumes, steamed sprouts and vegetable chaat, dalia/dhokla/ idli/ roti prepared by using sprouted legumes can be taken as evening snacks.
- Prefer to take low-calorie micronutrient rich beverages such as lemon-water jal-zeera, kanji over squashes, cold-drinks etc.
- Oat bran/ Oat meal/cracked wheat porridge, grilled sandwiches, missi roti or vegetable and sprouts stuffed paranthas along with a low calorie fruit are healthy breakfast options.

A sample menu is included herewith for your reference.

### Sample Menu

<b>Early Morning</b> Lemon Water/ Green Tea (6.00-6.30 am) Skimmed Milk (7.00-7.30 am)	<b>Lunch /Dinner</b> Salad (sprouts + vegetables) Multi Grain/ Bran Chapati Whole pulse/fish/chicken curry Beans/ladyfinger vegetable Raita/curd/dessert
<b>Breakfast</b> Oat bran porridge Grilled chicken/Paneer sandwich with cabbage	<b>Evening Tea</b> Tea Vegetable Dhokla
<b>Mid- morning</b> Water melon and Guava (1 serving)	

## 4.5.2 Principles of Diet Planning – Underweight

Underweight, we learnt, is a state when a person is in a negative energy balance i.e. energy intake is less than energy expended on various activities. Underweight individuals are generally malnourished and they usually have low reserves of adipose tissues, muscle and bone mass.

In this section, we shall learn about the various essential features related to dietary management of underweight individuals. Let us begin with identification of objectives:

### *Objectives of Diet planning*

The objectives of diet planning for an underweight individual include:

- to help the patient in gaining/attaining a desirable/ideal body weight,
- to replenish the depleted nutritional reserves of the body,
- to cure/treat the underlying cause, and
- to bring about behavioural modifications that can help in maintaining a good nutritional and health status.

We will now begin with our discussion on nutrient modifications and how to achieve a positive energy balance which is essential for increasing body weight.

*Energy:* Irrespective of the cause, weight loss is almost always associated with negative energy balance in the body. This energy deficiency could be due to a low food intake or increased requirements of the body (elevated RMR/increased expenditure on physical activity). Based upon the principles discussed in sub-unit on obesity, we will increase the energy intake by 500 Kcal to 1000 Kcal above the usual intake/RDI per day in order to help the patient in increasing his/her body weight by half to one kg in a week. We can also follow the procedure of calculating the IBW for the patient and then computing the energy intake by multiplying the IBW with energy prescribed for underweight individuals (with respect to their activity level) as given in Table 4.5 earlier.

*Protein:* Body composition details of underweight individuals indicate depleted protein reserves and a low muscle mass content. A high protein diet providing around 1.5-2.0 g of protein per kg IBW per day is recommended. Easily digestible proteins of high biological value should be given to the patient. The diet should therefore include milk/milk products, eggs, meat, fish, chicken, pulses (greater emphasis on pulses without husk.). Fermented foods (dhokla, idli, dosa etc.) being easy to digest should be included in the diet. Overnight soaking of whole pulses makes them easier to digest and more nutritious. Soy products such as tofu, soy milk and texturized soy meal/protein should be incorporated in the daily culinary practices.

*Fat:* Although underweight patients usually have depleted reserves of adipose tissue, we should not provide more than 25% of the energy from fats, keeping in mind the digestive capacity of the patient/tolerance limits. Incorporation of adequate amounts of fat help to make the meals energy dense and reduce bulk and improve palatability which can help in promoting an increased food intake. Emphasis should be laid on the inclusion of foods which contain appreciable amounts of invisible fat such as whole milk, curd/paneer/khoa/lassi prepared from whole milk, eggs, flesh foods, nuts etc. Emulsified fats like butter and cream, as well as, oils rich in medium chain triglycerides (coconut oil/coconut milk) would be better tolerated as compared to pure ghee, vanaspati and fried foods.

*Carbohydrates:* Carbohydrates should provide remaining energy or about 60% of the modified RDI for energy. Foods rich in simple carbohydrates should be preferred and those high in dietary fibre need to be avoided. This is so because such foods are easier to digest, have a low bulk and can thus help in promoting an increased food intake. High fibre foods increase bulk and may cause flatulence which can inhibit food intake. Sugar, honey, maple syrup, cane sugar, dextrose, dates, starchy tubers,

fruits and vegetables, cereals such as semolina, rice, chirwa (flattened rice), corn, sago, arrowroot, bread, pastas can be incorporated in liberal amounts. High fibre cereals such as bajra, jowar, ragi, whole/cracked wheat and fibrous vegetables/fruits should be avoided or given in small amounts.

*Vitamins and Minerals:* Deficiencies of several micronutrients can be commonly observed in underweight individuals. Plenty of fruits and vegetables in soft cooked form should be included in the diet. Since B-group vitamins particularly thiamin helps in releasing energy from food, they should be included in adequate amounts. Similarly, small amounts of citrus fruits (amla, lemon etc.) and yellow/orange coloured vegetables/fruits should be included to provide adequate amounts of vitamin A and C (improved immune function). If the diet contains good amount of milk, eggs and animal foods; deficiencies of vitamin D and A would not arise.

*Special Considerations*

Underweight patients should be advised to consume small, frequent, easy to digest, nutrient dense meals. The meals should have variety in terms of colour, texture, taste, flavour and mouth feel so that the patient feels interested and motivated to consume adequate amount of food. Plate waste must be accounted for and adjusted in subsequent meals especially if the patient is severely underweight. The diets of patients suffering from grade III of chronic energy deficiency may be required to be supplemented with high energy-high protein nasogastric tube feeds. Oral health supplements can also be added to the diet. Protein powders such as whey protein, soy protein, casein can be added to the prepared dishes to increase their nutritive value.

So far we have discussed about the important aspects of diet planning and life-style modifications during the management of obese and underweight patients. You should now make an attempt to answer the questions mentioned in review exercises and self-check your progress. If you are able to complete the exercise satisfactorily; proceed ahead and carry out the activity 1 and 2 given herewith. Through these activities you will learn how to plan diet(s) for obese and underweight patients.

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## **4.6 REVIEW EXERCISES**

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- 1) Enlist the various components which contribute towards the total body weight of an individual.

.....  
.....  
.....  
.....

- 2) Calculate the body mass index and identify the level of under/overnutrition for Mrs. Mala, housewife who is 5 ft. 3 inches tall and weights 78 kgs.

*Calculations of BMI:*

*Level/Category of Under/Overnutrition:*

3) Krishna is a sedentary busy office executive who has been experiencing breathlessness while performing basic personal activities. He is also finding it difficult to walk and sweats profusely on slight exertion. He is 5 ft. 6 inches tall and presently weighs 95 kgs. He has been advised to reduce weight. Based on the above details of the case, answer the following:

- a) Compute Krishna's ideal body weight.
  
  
  
  
  
  
  
  
  
  
- b) How much weight does Krishna needs to reduce to achieve his ideal body weight?  
.....  
.....
  
- c) Calculate the energy, protein and fat requirements for Krishna to help him in reducing weight (show your calculations here).

4) Tina is a 25 years old college student who loves to binge on fast food. She also nibbles on ready-to-eat snacks during late evening. Enlist atleast ten counseling tips for her that can help her from adding on excess body fat. At present she is 4.0 kgs above her ideal body weight.

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

5) What are the clinical implications of being underweight?  
.....  
.....  
.....  
.....

- 6) How can you make the following dishes nutrient dense so as to facilitate gain in weight?
- 1) Tomato cucumber sandwich
  - 2) Oat bran and cornflakes porridge
  - 3) Missi roti and curd
  - 4) Carrot beans soup with wheat puffs.

***Suggestions***

- 7) Enlist any three cooking methods which can help in increasing the calorie (energy) content of various dishes.

.....  
.....  
.....

- 8) Kapil is a 32 years old busy, active marketing executive who has lost 5½ kgs in the past 2 months. He has been advised to modify his food choices/dietary habits to suit his work schedule. Enlist a few useful tips for him, which can be helpful in preventing subsequent weight loss/promoting weight gain.

.....  
.....  
.....  
.....

Now that you have completed the exercises get down to planning diets for the obese and underweight in Activity 1 and 2 given herewith, as part of this practical.



**DIET PLAN OR OVERWEIGHT/  
OBESE INDIVIDUALS**

**Aim** : To plan a diet for an obese individual.

Date :

**Case Study** : Mr. Sharma is a 43 years old Food-Service Manager. He is 5 ft 6 inches tall and weighs 89 kgs. As part of his job, he socializes a lot and is fond of eating bakery products and non-vegetarian/fried snacks. He usually takes 2 servings of whisky everyday in the evening. He was diagnosed to be overweight (for the first time) around 15 years back. Since then he has tried to reduce his weight several times by keeping fasts or taking severe calorie restricted diets. Even if he is able to reduce 5-6 kgs at a given period, he is not able to maintain it. At present, he is experiencing breathlessness on walking and begins to sweat profusely while eating and performing essential personal and social activities. His clinical parameters i.e. total blood cholesterol, LDLs and triglycerides are indicating an upward (increasing) trend over the past six years.

Mr. Sharma has been identified to be 'at risk' of developing diabetes and coronary artery disease due to his excess body weight. He has been advised to reduce weight.

Based on this case study, now carry out the activity following the instructions given herewith.

**Introduction**

(Elaborate on what is overweight/obesity highlighting the causative factors in the space provided herewith).

Next, read the case carefully and identify at least three disease for which Mr. Sharma is at an increased risk.

Write down the risk/complications of obesity for Mr. Sharma.

**Step I**

On the basis of the details mentioned in the case study fill in the patient details in the format given below.

***Patient/Case Profile***

- Name:
- Age:
- Gender:
- Activity Lifestyle:
- Dietary habits
- Socio-economic status:
- Pathophysiological stress:
- Diet prescribed:

***Clinical Profile***

	<i>Patient Value</i>	<i>Normal Value</i>
--	----------------------	---------------------

- Body Weight
- Body Mass Index

How much weight does Mr. Sharma need to reduce? ..... kg.

Now identify the various goals of dietary modifications and enlist them in terms of their priority in ascending order in the space provided herewith.

***Objectives of Dietary Modification***

**Step II**

Keeping in mind the case details (identified in Step I), assess/calculate the nutritional needs of Mr. Sharma and compare them with the RDI for a healthy sedentary adult men. Write the calculation in the space provided herewith.

**Recommended Dietary Intake**

Nutrients	Normal	Modified
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Fat (g)		
Dietary Fibre (g)		
Dietary Cholesterol (mg)		

(Note: In order to compute his energy requirements, you may need to calculate his IBW and then multiply the IBW with calories recommended for a sedentary obese adult man.)

***Calculations:***

### Step III

Based upon the modified RDI, carefully write the food exchanges most suitable for Mr. Sharma in the format given herewith.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Skim Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat (Oil)					
Sugar (optional)					

### Step IV: Decide on the meal frequency most appropriate for Mr. Sharma.

(Hint: Perhaps a 4-5 meal pattern would be appropriate. Distribute the exchanges for providing balanced nutrition throughout the day in the format given herewith).

Exchange	No.	Early Morning	Break-fast	Lunch	Evening Tea	Dinner
Milk						
Skim Milk						
Meat (lean)						
Pulses						
Cereals						
Roots/Tubers						
Other Vegetables						
GLV						
Fruit						
Fat (oil)						

**Step V:** Using the exchanges available for each meal, plan a day's menu for Mr. Sharma. Remember to include dishes/ingredients which have a large volume but are low in calories (high fibre but low in fat and single carbohydrates) i.e. they should have a high satiety value/ long intestinal transit time.

**Menu for Mr. Sharma**

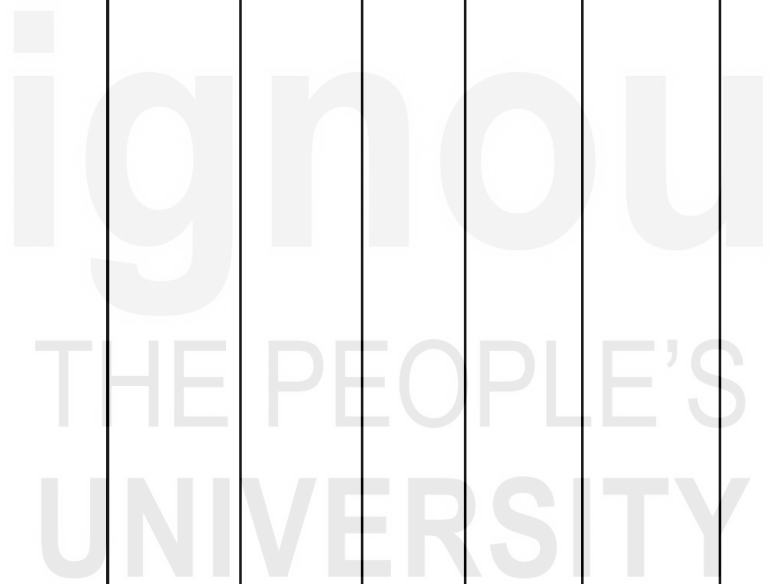
<b>Early Morning</b>	<b>Breakfast</b>	<b>Lunch</b>	<b>Evening Tea</b>	<b>Dinner</b>

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**Step VI: Detailed menu plan**

Calculate the energy, protein and other nutrient content of the diet in the format given herewith.

<b>Meal</b>	<b>Menu</b>	<b>Ingredient</b>	<b>Amt (g)</b>	<b>Exchange</b>	<b>Energy (Kcal)</b>	<b>Dietary Fibre (g)</b>	<b>Crude Fibre (g)</b>	<b>Visible Fat (g)</b>	<b>Invisible Fat (g)</b>
<b>Total</b>									



Using the values obtained for visible and invisible fat in the detailed menu plan; compute the total fat being provided in the diet. Also find out the difference (%) between the modified RDI for fat and that being provided through the diet.

Invisible fat (g) being provided through the diet planned.....

Visible fat (g) being provided through the diet planned.....

Total fat being provided through the diet plan ..... (g)

Modified RDI for total Fat ..... (g)

Difference = ±..... (g)

% difference = ± ..... %

**Mr. Sharma has never been able to maintain his last weight. Can you give him a few suggestions to help him in reducing and maintaining lost weight.**

*Related to Diet*

*Related to Life style*

**Conclusion**

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

Nutrient	Amount Computed through Diet	Amount Computed for Modified RDI	Suggestions for Improvement
Energy (Kcal)			
Fat (g)			
Dietary Fibre (g)			

**Submit your activity for evaluation.**

## DIET PLAN FOR UNDERWEIGHT INDIVIDUALS

**Aim** : To plan a diet for an underweight individual.

Date :

**Case Study** : Shweta is an 18 year old girl studying in class XIIth of a public school. Her height is 5 feet 3 inches and she weighs 41 kgs at present. She has been losing weight for the past six months when she suffered from an episode of typhoid. Prior to fever, her weight was 52 kgs. She is fond of out-door sports but at present is not able to play much due to weakness. She is finding it difficult to keep pace with her studies as she feels lethargic, listless dizzy and tired. After school she goes to a coaching center for 2<sup>1/2</sup> hours. On her way back she goes to nearby market to buy stationary/groceries on alternate days. She prefers to commute by walking/cycling. Her recent medical check-up has indicated following details:

Total fat = 17%

Muscle mass = 23%

Haemoglobin = 10.1 gm/dl

Vitamin B<sub>12</sub> (serum) = 119 pg/ml (normal range : 140-820 pg/ml)

Serum retinal = 25 µg/dl (normal = 30-80 µg/dl)

She has been advised to select high energy, high protein foods which are also good sources of vitamin A and vitamin B<sub>12</sub>. Her case has been forwarded to a dietitian to plan a day's diet in accordance with her activity and study schedule. Her school/coaching and other important timings are :

School timings	:	8.00 am to 2.30 p.m.
Coaching timings	:	4.00 p.m. to 6.30 p.m.
Market work	:	6.30 p.m. to 7.45. p.m.
Sports/play (active)	:	one hour in school
Total walk/ cycling	:	45 minutes

Now, based on this case study, plan a diet for Shweta.

### Introduction

Define underweight and identify the risk factors associated with weight loss.

Classify Shweta's body weight as per the chronic energy deficiency classification given earlier in Table 8.3 and write the response below:

**Shweta is suffering from ..... stage of CED**

Now plan a diet for Shweta following the steps indicated herewith.

**Step I**

Read the case carefully and identify the following details for developing a diet plan for Shweta.

***Patient/Case Profile***

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

***Clinical Profile***

*Patient Value*

*Normal Value*

Haemoglobin (g%):

Vitamin B<sub>12</sub> (pg/ml):

Retinon (mg/dl):

Body weight (kg):

Body mass index (kg/m<sup>2</sup>):

Total Body fat (%):

Total body muscle mass (%):

How much weight does Shweta needs to increase to achieve her ideal body weights?

.....kgs.

How many weeks would you target for the above mentioned weight gain?

.....weeks.

In view of Shweta's clinical/health profile and life-style; enlist the various objectives of her dietary/life-style management in the space provided herewith:

*Objectives of Diet Planning:*



## Step II

Keeping in mind the case details, assess/calculate the nutritional needs of Shweta and write them in the format given herewith. Compare her requirements with the RDI for a normal healthy 18 year old girl. (Refer to Table 1.1 given in Practical 1).

### Recommended Dietary Intake

Nutrients	Normal	Modified
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Fat (g)		
Vitamin A (mg)		
Iron (mg)		

(Note: The total food intake should be increased gradually. Underweight patients are usually anorexic and a drastic intake may also cause gastric discomfort etc.)

**Calculations:** (Write the calculations in the space provided herewith).

## Step III

Now select suitable food exchanges that can provide the above mentioned nutritional requirements for Shweta.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat
Whole Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat					
Sugar					

### Step IV

Based upon the fact that small frequent nutrient dense meals can help in facilitating increased food intake; carefully distribute the above mentioned exchanges for different meals (6-7 meals/day) in the format given herewith.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Early Late	Dinner	Post Dinner
Whole Milk								
Meat								
Pulses								
Cereals								
Roots/Tubers								
Other Vegetables								
GLV								
Fruit								
Fat								
Sugar								

### Step V

Using the exchanges available for each meal, plan a day's menu for Shweta. Do keep in mind to include nutrient dense dishes liked by adolescents/young girls. You may need to refer back to the text on diet/life-style management. Also mention the meal timings.

#### Menu:

Early Morning	Breakfast (Tiffin-short break)	Mid Morning (Tiffin-Long break)	Lunch
Early Evening	Late Evening	Dinner	After Dinner



*Enlist a few counseling tips to help Shweta in coordinating her meal timings with her activity schedule.*

**Conclusions:**

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

<b>Nutrient</b>	<b>Amount Computed through Diet</b>	<b>Amount Computed for Modified RDI</b>	<b>Suggestions for Improvement</b>
Energy (Kcal)			
Protein (g)			
Carbohydrate (g)			
Iron (mg)			
Vitamin A ( $\mu$ g)			

**Submit your activity for evaluation.**

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# PRACTICAL 5 PLANNING DIETS FOR METABOLIC DISEASES

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## Structure

- 5.1 Introduction
- 5.2 Different Types of Metabolic Diseases
- 5.3 Principles of Dietary Management – Diabetes Mellitus
- 5.4 Principles of Dietary Management – Gout
- 5.5 Review Exercises

*Activity 1:* Diet Plan for Non-Insulin Dependent Diabetes Mellitus (NIDDM)

*Activity 2:* Diet Plan for Insulin Dependent Diabetes Mellitus (IDDM)

*Activity 3:* Diet Plan for Gout

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## 5.1 INTRODUCTION

---

In this practical unit, we shall first quickly recapitulate about the various characteristic features and clinical symptoms of diabetes and gout about which you have already studied in the theory course (MFN-005) in Unit 12 and 13. Thereafter, we shall learn about the various practical aspects/principles of dietary management which are imperative for the successful treatment/management of the above mentioned diseases. These will be followed by practice exercises that would help you in learning about the step-by-step process required for individualized planning diets as per the requirements of the patients.

### Objectives

After undertaking this practical, you will be able to:

describe the different types of metabolic diseases,

discuss the practical aspects/principles of dietary management which are imperative for the successful treatment/management of diabetes mellitus and gout, and

plan diets for individuals suffering from diabetes and gout.

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## 5.2 DIFFERENT TYPES OF METABOLIC DISEASES

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Metabolic diseases can be described as *those arising due to clinical and/or biochemical changes/interruptions in the normal metabolic processes of the human system*. Several metabolic disorders have been identified and the spectrum includes very commonly prevalent diseases such as diabetes mellitus, gout, phenylketonuria, as well as, those which are very rare such as hartnup disease, valienemia, cystathionuria etc. to name a few.

You may have already studied about these diseases in the Unit 12 and 13 of theory course on Clinical and Therapeutic Nutrition (MFN-005). However, mentioned below is a brief description/review regarding diabetes mellitus and gout which is the focus of this practical.

### A) *Diabetes Mellitus*

Diabetes mellitus is a chronic metabolic condition characterized by derangements in the metabolism of glucose, as well as, abnormalities in the metabolism of fat, protein and other substances.

As has been mentioned in the theory course, in Unit 12, diabetes is a metabolic disorder characterized by the following symptoms: Glycosuria, Hyperglycemia, Polyuria/nocturia, Polydipsia, Dehydration and Ketoacidosis.

Diabetes is a chronic metabolic disorder which cannot be completely cured/treated. It can however be managed carefully in order to prevent/delay the development of complications. The major treatment/management objectives should be targeted towards:

Dietary modifications

Life-style management

Adherence to drug/insulin schedule

We shall now proceed towards the salient features of Gout.

### B) *Gout*

Gout is a metabolic disease of heterogeneous nature, often familial, associated with abnormal amounts of urates in the body and characterized early by a recurring acute arthritis. The associated hyperuricemia is due to overproduction or/and under-excretion of uric acid. Adult men (>30 years) and post-menopausal women are 'at-risk population' for gout.

The characteristic features/symptoms and signs of gout include:

- Elevated serum uric acid (>7.5 mg/dl) levels. The risk of developing uric acid renal stones increases by 50% when the serum urate levels reach above 13 mg/dl.
- Erythrocyte Sedimentation Rate and White cell count rise during an acute attack.
- Patient generally experience a rise in body temperature (> 39°C).
- The metatarsopharyngeal joint of the great toe is the most susceptible joint ('podagra'), although others, especially those of the feet, ankles and knees are commonly affected.
- The involved joints are swollen and exquisitely tender. The overlying skin is tense, warm, dusky red and painful to touch.
- Tophi may be found in the external ears, hands, feet, olecranon and prepatellar bursas. Their size may be as small as that of a pin head to as big as a golf ball. *Tophus* a characteristic lesion of gout, is a nodular deposit of monosodium urate mono hydrate crystals, with an associated foreign body reaction.
- Material aspirated from a tophus shows typical crystals of sodium urate which is used as a laboratory test to confirm diagnosis.

The treatment schedule of gout generally includes taking care of the acute phase first followed by management of hyperuricemia.

#### a) Acute Phase:

- Complete bed rest for at least the first 24 hours after an acute attack. Early ambulation may precipitate recurrences.

- Drugs generally prescribed include: Non-steroidal, anti-inflammatory drugs (NSAID'S), Colchicine, Cortico-steroids and Analgesics.
- b) Management between attacks:
- Diet modifications
  - Avoidance of hyperuricemic medications
- c) Chronic Tophaceous Arthritis
- Maintaining serum uric acid levels below 5 mg/dl (diet and drugs)
  - Surgical excision of large tophi.

With this basic review, let us now learn about the objectives and principle of dietary management for diabetes viz. non-insulin and insulin dependent diabetes mellitus, and gout.

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### 5.3 PRINCIPLES OF DIETARY MANAGEMENT– DIABETES MELLITUS

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Look up Unit 12, section 12.3 in the theory Course (MFN-005) for the details related to the dietary management of diabetes. Dietary management of diabetes has gone through several phases of modification. It was as early as in 1797, that *John Rollo*, a British Army Surgeon-General, recommended a very low carbohydrate, high fat diet (complete avoidance of almost all vegetables too). In 1865, a French clinician *Appolinaire Bouchardat* developed a more palatable low carbohydrate, high fat diet by eliminating milk and allowing some boiled vegetables. His reports further popularized the already widely accepted practice of using a low-carbohydrate- energy restricted diet for diabetic individuals in the pre-insulin era. The famous “Allen Starvation Treatment” was developed by *Frederick M. Allen* in 1912 wherein the lives of patients were sustained on a 1,000 Kcal diet providing only 10 grams of carbohydrate. High carbohydrate energy-restricted diets were advanced by *Thomas Willis* in 1675 and the “insulin era” began in 1921 with the discovery of insulin.

The dietary management of diabetes as is being practiced today is based on the following objectives:

- to achieve and maintain normal blood glucose levels,
- to attain and maintain a desirable/ideal body weight,
- to prevent/delay/reduce the onset/severity of short - and/or long-term complications,
- to maintain an optimum nutritional status by providing individualized care, and
- to help the patient with self-care and monitoring of diabetes.

The diabetic nutrition plan should therefore be individualized and must focus not only on the diabetic state but also on overall health and well-being of the patient. Let us quickly recapitulate the basis of assessing the requirements of the patients.

*Energy*: The requirement for energy should be computed on the basis of age, gender, type of diabetes, drugs/insulin and activity pattern, as well as, pathophysiological stress (if any). For adult diabetics the energy requirements are generally based on the achievement and maintenance of ideal body weight. In case of juvenile diabetics, we also need to take care for providing adequate calories/other nutrients to facilitate normal physiological growth and development. Thus, for adult diabetics (generally NIDDM patients) the ideal body weight can be calculated on the basis of height:

IBW (Men) = 48 kg for first 5 feet + 2.7 kg for each additional inch ( ± 10% for build)

IBW (Women) = 45.5 kg for first 5 feet + 2.3 kg for each additional inch ( ± 10% for build)

The value of IBW can then be utilized for computing the energy requirements of normal, under/over weight patients as given in Table 5.1.

**Table 5.1: Energy requirements for diabetic patients**

Energy Requirements (Kcal per kg IBW Per Day)			
Activity	Obese	Normal	Underweight
Sedentary	20-25	30	35
Moderate	30	35	40
Heavy	35	40	45-50

*Protein:* The protein intake should be kept to normal or slightly increased intake because in poorly regulated cases of diabetes; large quantities of nitrogen get excreted in the urine. Secondly, since proteins have a longer gastrointestinal transit time; the post-prandial increase in blood glucose would be slower and tapered as compared to after the consumption of meals low in proteins. Plant origin protein food sources (legumes, whole, pulses and their products) being high in fibre but low in saturated fat/cholesterol should be preferred over animal origin protein food sources particularly in case of adult/overweight/hypercholesterolemic diabetics.

Thus, we can include adequate amounts of whole pulses (horsegram, Bengal gram, green gram whole, rajmah, cowpea), legumes, beans, skimmed milk, cottage cheese (paneer)/curd/yoghurt made from skimmed milk, tofu, soya milk, lean meat such as chicken, egg white, fish and other marine foods may be included in the diet. Cereals/cereal flour can be substituted with whole Bengal flour, soya flour, besan to increase the protein and fibre content of chappatis and breads. Similarly, sprouts can be added to salads, sandwiches, chelas, patties, idlis etc.

*Carbohydrates:* Both the quantity and quality of carbohydrates play a crucial role in the management of diabetes. The carbohydrate allowance may vary from 55% to 60% depending upon the severity of hyperglycemia, weight, type of drugs/insulin, activity pattern, age and gender of the patient. While a carbohydrate intake of <100gm may cause ketosis (hypoglycemia); an intake of >300 gm may elicit a hyperglycemic shock. The National Diabetes Associations of several countries recommend a nutrition plan that provides generous amounts of complex carbohydrates and fibre as it lowers the glycemic index (glycemic response) of a particular food/meal.

The total carbohydrate should be evenly distributed throughout the day depending upon the drugs/insulin being given to the patient. For instance, NIDDM patients on hypoglycemic drugs need to consume carbohydrate in equal amounts for breakfast, lunch and dinner. Patients on a combination of intermediate and long acting insulin need to take some carbohydrate early morning, as well as, after breakfast apart from that in breakfast, evening, lunch and dinner. Patients on short acting insulin must consume meals within half-an-hour of administering the injection.

Diets providing liberal amounts of fibre and complex carbohydrates have been highly recommended for diabetics. Most of the patients benefit from diets providing 25 gm dietary fibre for each 1,000 Kcals consumed. The benefits of incorporating fibre rich foods in the diet have been enlisted in Box 5.1.



Box 5.1	Advantages of High Fibre Intake for Diabetics
<ul style="list-style-type: none"> <li>• Slows nutrient digestion and absorption.</li> <li>• Decreases post-prandial plasma glucose</li> <li>• Increases tissue insulin sensitivity</li> <li>• Increases insulin receptor number</li> <li>• Stimulates glucose use</li> <li>• Attenuates hepatic glucose output</li> <li>• Decreases counter-regulatory hormone release (such as glucagon)</li> <li>• Lowers serum cholesterol</li> <li>• Lowers fasting and post-prandial serum triglycerides</li> <li>• May attenuate hepatic cholesterol synthesis</li> </ul>	

Source: Anderson JW, Nutrition, management in Diabetic Mellitus in: Modern Nutrition in Health and Disease Yong and Shills.

High fibre foods also have a low glycemic index. Look up sub-section 12.3.3 in Unit 12 in the theory (MFN-005) course to recapitulate your understanding about the glycemic index concept. Diabetics should be recommended to preferably consume whole cereal grains (wheat, jowar, bajra, ragi), whole pulses (soyabean, horsegram, whole Bengal gram, rajmah, cowpea, whole moong, whole urad, sprouts), high fibre vegetables (cabbage, lotus-stem, drumstricks, beans etc.) and fruits (guava, pineapple, apple, peaches, avocado etc.) with a lower glycemic index. Substitution of cereals with pulses/vegetables (chappati prepared by using whole wheat flour + soyaflour/ whole Bengal gram flour/ besan methi/ spinach or vegetable idli/uttpam, pulao with sprouts etc.) can also help in lowering the glycemic response to food. Preparations like roasted channa chappaties, sprouted dal are more suitable than boiled rice, khichri, washed dals and fruit juices. Similarly, raw vegetables (salads) will have a lower glycemic response as compared to their cooked counterparts. Sipping 50 grams glucose slowly over several hours shall produce a smaller increase in blood glucose than would a rapid intake. Box 5.2 gives a list of food stuffs with their respective glycemic index.

#### Box 5.2 Glycemic Index of Foods

Item	Glycemic Index	Item	Glycemic Index
White wheat bread	75 ± 2	Apple (raw)	36 ± 2
Whole wheat bread	74 ± 2	Orange	43 ± 3
Wheat Roti	62 ± 3	Banana	51 ± 3
Chappathi	52 ± 4	Pineapple	59 ± 8
White boiled Rice	73 ± 4	Mango (raw)	51 ± 5
Brown Boiled Rice	68 ± 4	Watermelon (raw)	76 ± 4
Barley	28 ± 2	Potato (boiled)	79 ± 4

Item	Glycemic Index	Item	Glycemic Index
Instant oat porridge	79 ± 3	French Fries (potato)	63 ± 5
Rice porridge/ Congee	78 ± 9	Carrots (boiled)	39 ± 4
Millet porridge	67 ± 5	<b>Dairy Products</b>	
Sweet corn	52 ± 5	Milk (full fat)	39 ± 3
Cornflakes	81 ± 6	Milk (skim)	37 ± 4
		Ice Cream	51 ± 3
<b>Miscellaneous</b>		<b>Pulses</b>	
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		

*Fat:* Fats being concentrated sources of non-carbohydrate calories, can be given in normal amounts i.e. 20-25% of the total energy to juvenile and adult diabetics (non-obese) without coronary artery diseases or hypercholesterolemia. The total fat intake should comprise of <math>1/3^{\text{rd}}</math> each from saturated and poly-unsaturated fats, whereas the remaining >math>1/3^{\text{rd}}</math> should come from mono-unsaturated fats. In case of hyperlipidemic diabetics; the saturated fat intake should be <math><7\%</math> and the dietary cholesterol allowance should be <math><200\text{ mg/day}</math>. However, in case of diabetics without coronary heart disease the dietary cholesterol intake can be more liberal i.e. 300 mg/day.

Animal foods such as red meats (goat, buffalo, pork etc.) egg yolk, whole milk and whole milk products you may recall are rich sources of cholesterol, as well as, saturated fats. Plant foods do not contain cholesterol as such but certain plant foods such as nuts and oilseeds being rich in saturated fatty acids can result in the elevation of serum lipids among obese and other 'at risk' individuals. These should therefore be avoided. Lean meats (marine food, chicken), curds, yoghurt and cheese (paneer) made from skimmed milk are low in cholesterol and can be taken in recommended amounts.

*Alcohol:* Alcohol intake should be discouraged because it is a concentrated source of calories (7 Kcal/gm). This is particularly important for overweight/obese diabetics with or without cardiac/liver/nerve complications. The calories consumed through alcoholic drinks should be counted in the total energy intake by the patient from carbohydrate. Wine, beer or shandy has more starch; spirits like whisky, rum, gin are lower in carbohydrates and therefore a better choice. If consumed for social reasons, not more than one serving should be consumed one to two times in a week. Alcoholic beverages not only increase the risk for gastritis, liver and nerve damage; but they also upset the timings of food thereby spoiling diabetic control. Calorie and sodium content of some alcoholic beverages is given in Table 5.2. You may use this information while planning diets or while counseling patients regarding use of alcoholic beverages.

**Table 5.2: Calorie and sodium content of some alcoholic beverages**

Drink	Calories (Kcal)	Sodium (mg)
Beer, regular	41	5.3
Beer, light	28	2.8
Gin, rum, vodka, whiskey	250	trace
Table Wine, 12.2% alcohol/vol.	86	3.5
Dessert wine, 18.5% alcohol/vol.	137	3.3

**Note:** Alcoholic beverages are customarily served in special glassware, the size of which tends to standardize the alcoholic content.

1 cordial glass = 20 ml    1 sherry glass = 60 ml    1 champagne glass = 150 ml  
 1 brandy glass = 30 ml    1 cocktail glass = 90 ml    1 tumbler = 240-360 ml  
 1 jigger = 45 ml    1 burgundy glass = 120 ml    1 mixing glass = 360 ml

*Artificial Sweeteners:* Artificial sweeteners can be consumed by diabetics as a substitute for sugar in moderation. A sugar substitute is a food additive which duplicates the effect of sugar in taste, but often with less food energy. Aspartame, saccharin, acesulfame-K and cyclamate are most commonly consumed non-nutritive sweeteners, whereas, fructose and polyalcohols of sucrose, mannose and xylose (sorbitol, manitol and xylitol) are frequently used nutritive sweeteners.

*Life Style and Exercise:* An active scheduled life style involving regular and sustained exercise(s) can help in improving glycemic control. An active life style and regular exercise helps in:

- preventing sharp increase in the post-prandial blood glucose levels,
- enhancing insulin sensitivity,
- helping in weight management,
- reducing the dependence/requirement of drugs/insulin,
- improving muscle mass, and
- reducing the risk of constipation, heart disease etc.

As a dietitian, we may need to check the exercise schedule of our patients carefully. Depending on the type, duration/severity of exercise changes may need to be made in the amount/type/distribution of carbohydrates. For instance, a 20 minutes walk may not need any additional carbohydrate unless it is immediately prior to a scheduled meal. However, a short session of vigorous exercise (badminton, volleyball, football) may necessitate 10-20 gram carbohydrate beforehand. Similarly, rapidly absorbed carbohydrate (glucose drink/tablets, small chocolate bar) may be necessary before a burst of intense activity, whereas, more slowly absorbed carbohydrates (sandwich, biscuits) may be appropriate for sustained exercises. Dietitians must effectively counsel school going children and adolescents to take their meals/snack before their games period/exercise.

Having discussed the various aspects of dietary management for diabetics in association with lifestyle and drugs, let us now translate the above information in terms of practical tips that can be utilized during patient counseling. As we all know that effective counseling can help the patient in adhering to self-discipline which plays a crucial role in maintaining a good glycemic control and is critical towards the prognosis of diabetes (delaying the onset/severity of complications).

Here are a few useful tips. You may add or modify these points according to the individual requirements of the patient.

***Handy Tips Related to Diet for the Diabetics***

- Whole grain cereals (wheat, jowar, bajra, ragi), whole grain cereal flours, sprouted cereals, bread prepared by using whole wheat flour, cracked wheat, wheat bran should be preferred over low fibre cereals such as rice, chirwa, suji, refined wheat flour (maida), arrowroot, sago and their products such as vermicelli, pastas, bread/biscuits/bakery products/kulchas etc.
- Foods rich in SFA's i.e. butter, cream, margarine, pure ghee, egg yolk and animal fat should be completely avoided. Emphasis should be laid on the use of vegetable oils rich in PUFA's, MUFA's such as olive, safflower, rice bran, corn, cottonseed oil etc.
- It is a good option to keep changing oils used for cooking. For instance, olive, safflower, corn and rice-bran oil may be used interchangeably over a period of 6 months.
- Fried foods should be consumed in restricted amounts.
- Margarine, several spreads/bread-spreads are prepared by using hydrogenated fat and should therefore be avoided. Bakery products (Patties, cookies, biscuits), kachori or mathri is more "khasta" it would contain a higher amount of hydrogenated fat (vanaspati)/oil.
- Food should preferably be cooked by dry heat methods (roasting, sautéing, grilling, baking, micro-wave). Moist heat methods (boiling, simmering) should be avoided as far as possible. Non-stick cookware helps in reducing the amount of fat used for cooking and can be helpful particularly for obese and/or hypercholesterolemic diabetics.
- Roasted channas/soyabean/Bengal gram dal, soya and wheat puffs mixed with oat/wheat flakes are good ready-to-eat snacks.
- Whole pulses (soyabean, cowpea, rajmah, whole moong, whole urad, whole Bengal gram, horse gram), legumes, sprouts and whole pulse flour (whole Bengal gram flour, soya flour, whole moong flours as a substitute for cereals) should be preferred over de-husked washed pulses ("dhuli dal") such as arhar, washed moong/masoor/urad.
- Tubers and starchy vegetables such as potato, yam, colocasia sweet potato should be avoided.
- Skimmed/low-fat and skim milk products such as curd, yoghurt, paneer should be preferred particularly by adult and obese diabetics.
- Lean meats such as poultry (chicken, egg white), fish should be preferred over red meats (goat, buffalo, cow, pork) and egg yolk.
- High fibre and/ or low calorie vegetables should be preferred such as amla, cabbage, drumstick, raddish, cucumber, lotus-stem, beans, ladyfinger, tinda, bitter gourd (karela) and leafy vegetables (amaranth, lettuce, fenugreek, mustard) should be consumed liberally.
- High fibre and/or low calorie fruits such as apple, guava, pineapple, raspberries, musk melon, water melon, pear, bael should be preferred over mango, banana, grapes etc.
- It is advisable to consume plenty of raw vegetables especially in the form of salads (with sprouted cereals/pulses) before meals and along with their edible peels wherever feasible.

- Raw, whole fruits (1-2 servings per day) should preferably be consumed with their edible peels.
- Idlis, poha, dalia, uttapam, dhokla prepared by incorporating sprouted pulses/legumes and plenty of vegetables are nutritious evening snacks.
- If the patient is hypertensive; restrictions may be required in the use of cooking/table salt. Pickles, chutneys, preserves, baked items, canned food and salted snacks should also be avoided.
- Lemon water, zeera pani, kanji, lemon tea, tea, butter milk (lassi) are better options over fruit juices, fruit drinks and soft-drinks (colas etc.).
- The fibre intake can be increased by using commercially available sources of fibre such as guar-gum (obtained from seeds of cluster bean), Xanthum gum, neem bark/leaves powder, husk/bran of cereals/pulses and edible peels of raw fruits/vegetables.

**Handy Tips Related to Meal Pattern**

- As a thumb rule, diabetics should avoid both feasting and fasting.
- A fixed meal pattern should be followed and meals should be consumed within ½ to 1 hour of taking hypoglycemic drugs/ short-acting insulin (refer to Box 5.3 for more information regarding food intake with respect to insulin type).

Box 5.3		Food Intake with respect to Insulin Type		
Type	Action Starts	Duration of Action	Critical Meal Tmings	
Humalog	5 min	½ - 2 hrs	Immediately or before	
Plain/regular	½ hr	2 - 4 hrs	Within ½ hr	
NPH	½ hr	4 - 12 hrs	1 <sup>st</sup> hr, 9 <sup>th</sup> to 10 <sup>th</sup> hr	
Lente	½ hr	4 - 16 /hrs	1½hr to 2 <sup>nd</sup> hr, 5 <sup>th</sup> to 6 <sup>th</sup> hr, 10 <sup>th</sup> to 12 <sup>th</sup> hr	
Ultralente	4 hrs	6 - 24 hrs	4 <sup>th</sup> hr, before bedtime	

- Also distribution of carbohydrates according to type of insulin should be considered while planning diet which is shown in Table 5.3 below:

**Table 5.3: Distribution of Contribution of Carbohydrates according to type of insulin**

Mode of Treatment	Breakfast	Lunch	Tea	Dinner	Bedtime
None or Oral	1/3	1/3	20-30 g	1/3	None
Short acting insulin (At Breakfast and Dinner)	2/5	1/5	-	2/5	None
Intermediate (NPH/Lente)	1/7	2/7	1/7	2/7	1/7
Long acting + regular	1/5	2/5	-	2/5	20-40 g CHO
Long acting + regular insulin (At breakfast)	1/3	1/3	-	1/3	20-40 g CHO
Intermediate + regular for Type 1 Diabetes	2/10 + 1/10 during mid morning	2/10	1/10	3/10	1/10

- *Exercise* should always be after a meal and in case of vigorous sports/games, a small snack may be consumed to avoid hypoglycemia.
- Food should be consumed in normal quantity during common *illness* such as diarrhoea/vomitting or fever. However, the blood glucose levels may rise unexpectedly. Therefore, it is recommended to check blood glucose every 4-6 hours and take small amounts of short-acting insulin/drugs accordingly. To avoid hyperglycemic shock (coma) the patients should also be advised to check urine for ketones (with Gluketur strips).
- Diabetics who habitually smoke or drink alcohol have higher frequency of morbidity and mortality particularly due to cardiac complications. If alcoholic drinks need to be taken for social reasons, it is advised to take a small diluted drink and sip it slowly over a period of 30-45 minutes atleast.
- Diabetics can occasionally consume *fast-foods*. The former or the subsequent meal must comprise of a liberal serving of raw vegetables and sprouted legumes, as well as, plenty of fluids preferably plain water.
- White consuming meals in a social gatherings (parties, marriage conference etc.); an attempt should be made to choose low calorie foods. Guide the patient to take liberal amount of salads, yoghurt/curd preparations and small amounts of cereal preparations. Avoid fried and sweet high carbohydrate foods such as pastries, ice-cream, gulabjamun, halwas, potato cutlets, samosas. Do not miss the insulin/drug before going to such gatherings.

A sample menu for a non insulin dependent diabetic patient is given for your reference herewith.

***Sample Menu for a non insulin Dependent Diabetic***

<b><i>Early Morning</i></b>	<b><i>Breakfast</i></b>
High fibre cracked wheat biscuits Tea or Warm water with Lemon	Egg white/chicken /paneer preparation Oat meal/ bran porridge (S.milk) Toast/cheela/chappati Guava/pineapple
<b><i>Evening Tea</i></b>	<b><i>Lunch/Dinner</i></b>
Tea or coffee or lassi or soya milk Vegetable dalia or Sprouted Channa/wheat	Salad with sprouts (whole moong, channa, rajmah etc.) Mixed vegetable (cabbage, ladyfinger, brinjal etc.) Whole pulse Chappati (wheat flour substituted with soya flour, whole Bengal gram flour) Raita/plain curds cone meal) Fruit (in one meal)
<b><i>After Dinner</i></b>	
Bajra kheer or cracked wheat pudding.	

With a sample menu for NIDDM we end our study on the dietary management of diabetes mellitus. Next, we move on to gout.

## **5.4 PRINCIPLES OF DIETARY MANAGEMENT– GOUT**

Dietary management is an important aspect of treatment during symptom free periods of gout and is intended to minimize urate deposition in tissues, which causes chronic tophaceous arthritis, and to reduce the frequency and severity of reoccurrences. The objectives of dietary management are highlighted next.

*Objectives:*

- to reduce the serum uric acid levels (< 5 mg/dl),
- to help in achieving and maintaining an Ideal Body Weight,
- to maintain an optimum nutritional status, and
- to prevent subsequent episodes of gout.

Let us recapitulate the nutrient requirements next.

*Energy:* Several epidemiological studies indicate that patients with gout have a higher frequency of obesity, and some of the correlates of obesity, such as diabetes, hypertension and ischemic heart disease, occur with a greater frequency with a subsequent increase in body weight; particularly when the body weight increases by 30% and above IBW. Thus, overweight/obese patients should be prescribed a weight reduction diet. A reduction in the energy intake by 500 Kcal/ day can help in reducing 500 grams of body weight in a week.

As has been discussed earlier, we can compute the modified energy intake for an adult sedentary man/woman by using the following formula:

IBW (Men) = 48 kg for first 5 feet + 2.7 kg for each additional inch

IBW (Women) = 45.5 kg for first 5 feet + 2.3 kg for each additional inch ( ± 10% for build)

Using this IBW, we can calculate the energy requirements for the patient as follows:

Energy intake for 24 hrs.= 20-25 Kcal/kg/IBW i.e. 20-25 Kcal × IBW

*Protein:* A high protein diet, particularly animal products have been found to be closely associated with a greater incidence of gout. Although the contribution of dietary purines to uric acid production is only small, regular or excessive consumption of purine rich foods (typically those rich in cell nuclei such as yeast rich foods or fish roes) has an impact on the total uric acid pool. Thus, foods particularly high in purines, such as sweet breads, fish roe, anchovies, sardines, liver and kidney should be completely avoided, foods moderately rich in purines such as animal meats, seafoods, beans, lentils, spinach and peas should be consumed in moderate amounts whereas, low purine foods such as cheese, eggs, fat, fruits, vegetables, nuts, milk, refined, cereals and certain beverages (tea, coffee) can be consumed liberally. Box 5.4 presents a list of high purine and low purine foods for your reference.

Box 5.4	The Purine Content of Foods
<b>Low-Purine Foods</b>	
<ul style="list-style-type: none"> <li>- Refined cereals and cereal products, cornflakes, white bread, pasta, flour, arrowroot, sago, tapioca, cakes</li> <li>- Milk, milk products and eggs</li> <li>- Sugar, sweets and gelatin</li> <li>- Butter, polyunsaturated margarine and all other fats</li> <li>- Fruit, nuts and peanut butter</li> <li>- Lettuce, tomatoes and green vegetables</li> <li>- Cream soups made with low-purine vegetables but without meat or meat stock.</li> <li>- Water, fruit juice, cordials and carbonated drinks</li> </ul>	
<b>High Purine Foods</b>	
<ul style="list-style-type: none"> <li>- All meats, including organ meats and sea food</li> <li>- Meat extracts and gravies</li> <li>- Yeast and yeast extracts, beer and other alcoholic beverages</li> <li>- Beans, peas, lentils, oatmeal, spinach, asparagus, cauliflower and mushrooms.</li> </ul>	

*Carbohydrate:* The amount of carbohydrate to be provided in the diet remains the same as for normal individuals. However, emphasis should be laid on the inclusion of high fibre foods such as whole pulses/legumes, cabbage, carrots, drumstick, jackfruit, lotus-stem, apple, guava etc; especially if the person is overweight/obese.

*Fat:* The quantity and quality of fat remains the same as for normal individuals. However, if the patient is overweight, obese or is at risk of heart disease; the diet should not provide more than 20% of the total energy from fat. Emphasis should be laid on the inclusion of vegetable oils high in MUFA/PUFA's such as soyabean, sesame, olive, rice bran oil.

*Alcohol:* Excessive alcohol consumption has been associated with gout for centuries, although it is less certain whether this is a direct effect of alcohol *pe se*, or an indirect effect of either the high purine content of some types of alcohol (particularly beer) or the contribution of alcohol to excessive energy intake and obesity. Alcoholic beverages particularly beer (light/regular/root) being high in purines, calories and sodium should be completely restricted.

*Fluids:* In order to lessen the risk of crystallization of urate in the urine, particularly if uricosuric drugs are used, it is important that patients consume sufficient fluid, possibly as much as 3.0–3.5 litres/day.

A sample menu for a gout patient is given herewith for your reference.

***Sample Menu for a Gout Patient***

<b>Early Morning</b>	<b>Breakfast</b>
Tea/ Warm Water with lemon	Cracked Wheat Porridge Wheat bran biscuits Poha Guava/Water Melon
<b>Lunch/Dinner</b>	<b>Evening Tea</b>
Salad (cucumber, raddish etc.) Curd/Raita Pulse preparation (Urad/ Whole moong dal) Vegetable preparation (Carrots, egg plant, ladyfinger, lotus stem etc.) Chappati (wheat flour + fenugreek/ Bengal gram flour etc.)	<b>Tea</b> Paneer-tomato sandwich or Puffed wheat and roasted channa dal and lotus stem mix.

So far we have discussed about the important aspects of diet planning and life-style modifications during the metabolic diseases. You should now make an attempt to answer the questions mentioned in review exercises and self-check your progress. If you are able to complete the exercise satisfactorily; proceed ahead and carry out the three activities given herewith. Through these activities you will learn how to plan diet(s) for patients suffering from diabetes mellitus and gout.



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## 5.5 REVIEW EXERCISES

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1) What do you understand by the term GLYCEMIC INDEX of food? How can we calculate glycemic index of food?

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2) Why do the requirements for proteins increase slightly during diabetes?

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.....  
.....  
.....

3) Give five useful tips to Sunil who is a diabetic pertaining to food selection and intake during an office party.

- 1)
- 2)
- 3)
- 4)
- 5)

4) What are purines? What is their contribution to the total uric acid pool in the body?

.....  
.....  
.....  
.....

5) What is the association between fluid intake and uric acid pool in the body/hyperuricemia?

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.....  
.....  
.....

6) Calculate the Ideal Body Weight of Mrs. Gupta, a housewife who is 5'3" tall.

.....  
.....  
.....  
.....

7) Enlist any five food stuffs which are very rich sources of purine.

.....  
.....  
.....  
.....

Now carry out the activities included in this practical.

## ACTIVITY

# 1

## DIET PLAN FOR NON-INSULIN DEPENDENT DIABETES MELLITUS (NIDDM)

Date :

**Aim** : To plan a diet for a non insulin dependent diabetic patient.

**Case Study** : Mr. Khanna is a busy office executive who was diagnosed to be suffering from NIDDM about three years back. Over the past 3 years he has experience several episodes of hyper and hypoglycemia. He is 5'7" tall and weighs 93 kgs. He is fond of non-vegetarian foods and has to socialize a lot as part of his work. At present he is on drugs glipizide 10 mg B.D. and Repaglinide 1.0 mg O.D. (15 minutes before breakfast). His major clinical parameters are:

Blood Glucose (F)	198 mg/dl
Blood Glucose (P.P.)	418 mg/dl
Glycosylated Haemoglobin (HbA <sub>1c</sub> )	8.6 %
Blood pH	< 7.3
Serum bicarbonates	< 15 meq/L
Plasma acetone	4+
Serum Triglycerides	280 mg/dl
Total cholesterol	217 mg/dl
Systolic Blood Pressure	104 mmHg
Diastolic Blood Pressure	65 mmHg

He has been advised to get involved in a regular physical exercise schedule and adhere to meal and medication timings. His case has been forwarded to a dietitian, for effective dietary management of his disease condition. Based on your understanding of diabetes carry out the following exercises in this activity.

- Enumerate the patient profile.
- Prioritize and enlist the various objectives of his treatment and management.
- Compare his clinical parameters with normal values.
- With respect to his anthropometrics and biochemical parameters, calculate his modified RDA.
- Plan a day's diet for him and calculate carbohydrate, crude fibre, cholesterol and sodium for the detailed menu plan.
- As a dietitian, enlist the various points that should be remembered for patient counseling regarding:
  - diet and meal pattern
  - exercise and life-style
  - managing social life.

Begin the activity by first presenting a brief review on diabetes mellitus in the introduction section.

**Introduction**

(Present a brief write-up on what is diabetes and its types with special reference to non insulin dependent diabetes).

**Step I : Patient’s Profile**

(Write the profile of the patient as per the format given herewith)

*Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

Patient weight (Present):

Patients Ideal Body weight:

Medical problems:

Nutritional problems (if any):



**Step II**

Assess/calculate the nutritional needs of Mr. Khanna and compare them with the RDI for a healthy adult man (refer to Table 1.1 in Pactical 1) in the format given herewith:

**Recommended Dietary Intake**

Nutrients	Normal	Modified
Energy		
Protein		
Carbohydrate		
Cholesterol		
Fat		
Crude Fibre		
Dietary Fibre		

**Note:** Points that may help you in calculating the dietary requirements and planning the diet are highlighted herewith.

- 1) First calculate the ideal body weight (IBW) of the patient using the formula given herewith.  
 $48 \text{ kg for first 5 feet} + 2.7 \text{ kg for each additional inch}$   
 i.e.  $48 \text{ kg} + 2.7 \times 7 = \dots\dots\dots \text{ kg (IBW)}$

The value obtained for IBW can then be employed for calculating the energy requirements of Mr. Khanna (to help him in reducing his excess body weight). Energy requirements for an adult sedentary man can be calculated as follows:

$$20 - 25 \text{ Kcal/ kg IBW/ day}$$

**Note:** Since the patient is overweight/obese, his calorie intake should be restricted.

**Step III: Based upon the modified RDI, carefully select the food exchanges most suitable for Mr. Khanna.**

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk*					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other vegetables					
GLV					
Fruit					
Fat (Oil)					
<b>Total</b>					

\*preferably skimmed

Hint: Foods rich in complex carbohydrates, particularly dietary fibre (soluble) should be included in the diet. Carbohydrate content of the exchanges should be calculated.

**Step IV: Distribute the above selected exchanges**

Distribute the exchanges keeping in mind the following :

- Meal (5-6 meal pattern may be followed)
- Medications
- Amount of carbohydrates to be provided in each meal (1/3<sup>rd</sup>).

Now distribute the exchanges in the format given herewith.

Exchange	Early Morning		Breakfast		Mid -Morning		Lunch		Evening Tea		Dinner		Bedtime	
	No.	CHO(g)	No.	CHO(g)	No.	CHO(g)	No.	CHO(g)	No.	CHO(g)	No.	CHO(g)	No.	CHO(g)
Milk														
Meat														
Pulses														
Cereals														
Other Vegetables														
GLV														
Fruit														
Fat														
<b>Total CHO</b>														

*Check:* The sum total of carbohydrate in Breakfast + Evening Tea = 1/3<sup>rd</sup> of the total carbohydrate being provided through the exchange plan. Similarly, carbohydrate being provided in Lunch+ Early morning = 1/3<sup>rd</sup> of total carbohydrate. And carbohydrate being provided in Dinner + Bed Time = 1/3<sup>rd</sup> of total CHO. Further, the Grand Total for carbohydrates being provided through each meal should be equal to the amount of carbohydrate computed in the exchange plan (selection of exchanges) in Step III.

**Step V: Plan a menu**

Using the exchanges available for each meal, prepare a menu (in the format given herewith) by selecting the food-stuffs most appropriate for NIDDM patients with elevated lipids. You may like to refer to the sample menu given earlier in sub-section 5.3.1 for planning the menu here for Mr. Khanna.

**Menu for a Day**

*Early Morning*

*Breakfast*

*Lunch*

*Evening Tea*

*Dinner*

*After Dinner*

**Note:** Choice of foodstuffs, pre-preparation and cooking methods should be such as to keep the glycemic index the lowest.



### **Patient Counseling**

In this section, write down some handy tips related to diet and meal pattern and life style which you would advocate for Mr. Khanna.

#### ***Diet and Meal Pattern***

(Enlist points pertaining to selection of food stuffs, substitution/choices, more appropriate methods of cooking food labels, meal pattern w.r.t medications).

#### ***Exercise and Life Style***

(Household chores, preference for stairs over elevators, meal and exercise, duration and type of exercise).

#### ***Managing Social Life***

(Correct choice of food-stuffs (quantity and quality) and beverages, snack substitution for meals, medications and meals consumed during socialization).

### **Conclusions**

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

<b>Nutrient</b>	<b>Modified RDI</b>	<b>Detailed Diet Plan</b>	<b>± % of Difference</b>	<b>Suggestions for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
CHO (g)				
Fat (g)				
Fibre (g)				

**Submit the activity for evaluation.**

\_\_\_\_\_  
**Counselor's Signature**

**DIET PLAN FOR INSULIN DEPENDENT DIABETES MELLITUS (IDDM)**

Date :

**Aim** : To plan a diet for a non insulin dependent diabetic patient.**Case Study** : Shweta is a 11 year old school student suffering from IDDM for the past 6 years. She commutes to school and back home by school bus and her school timings are 8.30 a.m. to 1.30 p.m. She has a games period everyday at around 10.30 –11.00 a.m. and is fond of outdoor sports. She likes to indulge in fast food and has the habit of nibbling particularly late in the evening. She has suffered from hypoglycemic shocks several times in the school and has been prescribed to take a combination of intermediate and depot insulin in the morning before going to school. Her average (6 months) fasting and post-prandial blood glucose levels have been 75 mg/dl and 220 mg/dl, respectively. She has been advised to take wholesome snacks/ meals as her tiffin to the school and avoid taking food from the canteen. Shweta's meal timings as suggested by the Dietitian are:

Breakfast :	7:30-8:00 a.m.
Short break (school) :	10.15–10.30 a.m.
Long-break:	12.00–12.20 p.m.
Lunch :	2.15 p.m.
Evening tea:	4.00 p.m.
Dinner :	7.30 p.m.
Bed Time:	10.00 p.m.

Now with this basic information, plan a diet for Shweta. Start the activity by first presenting a brief review on diabetes mellitus in the introduction section herewith.

**Introduction**

(On the basis of the details mentioned in the case and your understanding about IDDM, briefly describe this metabolic disorder and enumerate the major objectives of dietary management in terms of their priority).



**Step I:** Read the case carefully and mention the details of the patient in the format given below:

***Patient/Case Profile:***

Name: \_\_\_\_\_ Age: \_\_\_\_\_  
 Gender: \_\_\_\_\_ Activity: \_\_\_\_\_  
 Dietary habits: \_\_\_\_\_ Socio-economic status: \_\_\_\_\_  
 Patient weight (Present): \_\_\_\_\_ Patients Ideal Body weight: \_\_\_\_\_  
 Medical problems: \_\_\_\_\_  
 Nutritional problems (if any): \_\_\_\_\_

***Clinical Profile***

*Patient value*                      *Normal Value*

Blood Glucose (Fasting)

Blood glucose (Post Prandial)

**Step II:** Keeping in mind the case details assess/calculate the nutritional needs of Shweta and compare them with the RDI for a healthy child (refer to Table 1.1 in Practical 1).

**Recommended Dietary Intake**

Nutrients	Normal	Modified
Energy (Kcal)		
Protein (g)		
Carbohydrates (g)		
Fat (g)		
Dietary Fibre (g)		
Iron (mg)		
Calcium (mg)		

**Calculations:** (Write the calculations for deriving the calorie and protein requirement in the space provided herewith).

**Step III:** Based upon the modified RDI, carefully select the food exchanges most suitable for a school going diabetic child.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetable					
GLV					
Fruit					
Fat					
Sugar					
<b>Total</b>					

#### Step IV: Distribute the above selected exchanges

Distribute the exchanges keeping in mind the following points:

- School timings
- Meal timings
- Peak and tapering action of insulin
- Carbohydrate distribution for each meal
- Activity pattern

Write the exchanges in the format given herewith.

Exchange	Early Morning		Breakfast		Lunch		Evening		Dinner		Bedtime	
	No.	CHO (g)	No.	CHO (g)	No.	CHO (g)	No.	CHO (g)	No.	CHO (g)	No.	CHO (g)
Milk												
Meat												
Pulses												
Cereals												
Roots/Tubers												
Other Vegetable												
GLV												
Fruit												
Fat												
<b>Total</b>												

**Check:** As mentioned for the diet plan of NIDDM, the sum total of carbohydrate for all the meals should be equal to the carbohydrate calculated through the selection of various food exchanges (Step III). The amount of carbohydrate provided through distribution of exchanges for each meal should be equal to stipulated amount. For example, if we want to provide 1/7<sup>th</sup> of the total carbohydrate for evening tea; then the distribution of exchanges should be such that they provide only 1/7<sup>th</sup> of the total carbohydrate.

**Step V:** Using the exchanges available for each meal, prepare a menu for selecting the food-stuffs most appropriate for insulin dependent diabetic children going to school.

#### A Day's Menu for Shweta



### Step VII: Patient Counseling

Enlist handy tips for Shweta regarding food choices, meal pattern with respect to school timings, games period and activity pattern in the space provided herewith.

Enlist the suggestions you would give to Shweta and her mother regarding diet and meal pattern during weekends, holidays and vacations in the space provided herewith.

### Conclusions

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

Nutrient	Modified RDI	Amount Diet Plan	$\pm$ % of Difference	Suggestions for Improved Intake
Energy (Kcal)				
Protein (g)				
Crude Fibre (g)				
Dietary Fibre (g)				
Iron (mg)				
Vitamin A (I.U.)				

Submit the activity for evaluation.

## EXERCISE

# 3

## DIET PLAN FOR GOUT

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Date :

**Aim** : To plan a diet for a patient suffering from gout.

**Case Study** : Mr. Sen is a 49 year old shopkeeper. His height is 5'7" and he weighs 72 kgs. He is a chronic alcoholic and is fond of non-vegetarian foods. He is an old case of gouty arthritis and has suffered from several acute attacks over the past 6 years. He was admitted to the hospital complaining of acute pain and swelling in the big toes. At present, he is in the remission phase and his clinical parameters are as follows:

Serum uric acid: 8.9 mg/dl

Erythrocyte Sedimentation Rate: 16.7 mm/hr

White cell count:  $12.1 \times 10^3 \mu\text{l}$

He has been prescribed to take attopurinal 300 mg/day in order to help in maintaining serum uric acid and lends within the normal range. He has also been advised to consult a Dietitian to manage his condition.

Now, based upon your understanding of the disease condition carry out this activity and plan a diet for Mr. Sen. Begin by presenting an overview of the gout disease in the introduction section.

### **Introduction**

Briefly describe the clinical conditions mentioned in the case and enlist atleast three characteristic features for the same, in the space provided herewith:

**Step I:** Read the case carefully and write the patient profile as per the format given below:

**Patient/Case Profile:**

Name: Socio-economic status:  
 Age: Pathophysiological stress:  
 Gender:  
 Activity:  
 Dietary habits:

Diet prescribed:

Compare the clinical parameters of the patient with normal values in order to ascertain the severity of the disease.

**Clinical Profile**

	<i>Patient Value</i>	<i>Normal Value</i>
Uric acid (Serum)		
E.S.R.		
W.B.C.Count		

**Step II: Assess/Calculate the nutritional needs**

Keeping in mind the disease condition and case profiles; assess/calculate the nutritional needs of Mr. Sen and compare them with the RDI for a healthy adult man (sedentary). Record your answer in the format given herewith.

**Recommended Dietary Intake**

<b>Nutrients</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein		
Carbohydrates		
Fat		
Fluids		

**Calculations:** (write the calculations for deriving at the energy and protein requirements in the space provided herewith).

**Note:** We need to calculate the IBW for Mr. Sen in order to compute his energy requirements for weight reduction. The IBW can be calculated using the formula:

48 kg for first 5 feet + 2.7 kg for each additional inch

Energy requirements for an adult sedentary man can be calculated as follows:

20 - 25 Kcal/ kg IBW/ day

### Step III: Select the food exchanges

Based upon the modified RDI, carefully select the food exchanges most suitable for Mr. Sen. Write the exchanges in the format given herewith.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat (oil)					
Sugar					

### Step IV: Distribute the exchanges for the most suitable meal pattern

Write the distribution of exchanges in the format given herewith. (Hint: You may provide a 5 meals/day pattern).

Exchange	Early Morning	Breakfast	Lunch	Evening Tea	Dinner
Milk					
Meat					
Pulses					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat					
Sugar					

### Step V: Plan a menu

Using the exchanges available for each meal, prepare a menu by selecting the food-stuffs most appropriate for gout and overweight/obese patients. (Hint: Include plenty of low-calorie beverages and low/no purine foodstuffs).

#### Menu for Mr. Sen

Early Morning	Breakfast	Lunch	Evening Tea	Dinner

**Step VI: Detailed menu plan**

Calculate the energy, protein and other nutrient content of the diet in the format given herewith.

Meal	Menu	Ingredients	Amt (g)	Exchange	Energy (Kcal)	Protein (g)	Fibre (g)	Sodium (g)	Fluid (g)
<b>Total</b>									



### Conclusions

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

<b>Nutrient</b>	<b>Modified RDI</b>	<b>Amount Diet Plan</b>	<b>± % of Difference</b>	<b>Suggestions for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
Fibre (g)				
Sodium				



**Submit the activity for evaluation.**

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**Counselor's Signature**

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# PRACTICAL 6 NUTRITIONAL MANAGEMENT OF GASTROINTESTINAL DISORDERS

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## Structure

- 6.1 Introduction
- 6.2 Peptic Ulcers
  - 6.2.1 Pathophysiology
  - 6.2.2 Principles of Dietary Management
- 6.3 Ulcerative Colitis
  - 6.3.1 Pathophysiology
  - 6.3.2 Principles of Dietary Management
- 6.4 Lactose Intolerance
- 6.5 Review Exercises

*Activity 1: Diet Plan for Peptic Ulcer*

*Activity 2: Diet Plan for Ulcerative Colitis*

*Activity 3: Diet Plan for Lactose Intolerance*

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## 6.1 INTRODUCTION

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Disorders of the gastrointestinal tract encompass a wide range of diseases which may be as mild and ubiquitous in prevalence such as dyspepsia, gastritis, nausea, vomiting, diarrhoea to not so frequent in occurrence such as carcinomas, inflammatory bowel disorders, lactose intolerance, gluten enteropathy etc. The dietary management of some of the disorders can be as simple as modification in consistency to as complex as elimination of certain nutrient or providing elemental/ hydrolyzed formulas. Diseases such as peptic ulcers can be life threatening whereas; diseases such as ulcerative colitis can progress towards the development of carcinomas (requiring surgery). In this unit we shall learn and practice the dietary management of peptic ulcers and ulcerative colitis. Let us first begin with their pathophysiology and the impact of the disease condition on the nutritional status of the patient. Before we begin, we suggest you look up Unit 6 in the Applied Physiology Course (MFN-001) to revise the physiology of the gastrointestinal system. Also review Unit 14 in the Clinical and Therapeutic Nutrition Course (MFN-005) to recapitulate the causes, important signs and symptoms and the dietary management of peptic ulcer and ulcerative colitis.

### Objectives

After undertaking this practical, you will be able to:

- discuss few disorders linked with the gastrointestinal tract,
- describe the principles of dietary management for peptic ulcer and ulcerative colitis, and lactose intolerance, and
- plan diets for individuals suffering from these disorders i.e. peptic ulcer, ulcerative colitis and lactose intolerance.

## 6.2 PEPTIC ULCERS

Peptic ulcer, you may be aware by now, is any localized erosion or a break in the gastric/duodenal mucosa that arises when the normal mucosal defensive factors are impaired or are overwhelmed by aggressive luminal factors such as acid and pepsin. Let us first review the pathophysiology of peptic ulcers followed by the principles of dietary management.

### 6.2.1 Pathophysiology

Ulcers may develop in the stomach/jejunum (gastric ulcers) or /and in the duodenum (duodenal ulcers). Let us review these conditions.

*Gastric Ulcers* occur most frequently along the lesser curvature of the stomach. Look up Figure 6.8 in Unit 6 in the Applied Physiology Course (MFN-001) which illustrates the stomach. Gastric ulcers are associated with gastritis, inflammatory involvement of the oxyntic (acid producing) cells and atrophy of the acid and pepsin-producing cells with advancing age. Morbidity and mortality are higher among gastric ulcers due to haemorrhages as compared to in duodenal ulcers.

*Duodenal Ulcers* generally occur within the first few centimeters of the duodenal bulb, in an area immediately below the pylorus. They are characterized by increased acid secretion particularly nocturnal acid secretion and decreased bicarbonate secretion.

The major causes of ulcers are:

- Chronic infection of *helicobacter pylori*
- Consumption of hypersecretory agents such as non-steroidal anti-inflammatory drugs
- Alcohol, tobacco consumption and cigarette smoking
- Tea, coffee, spices
- Physical/emotional stress

The sign and symptoms which may adversely affect the nutritional status of patients suffering from ulcers include:

- Epigastric pain which is frequently described as gnawing, dull, aching or “hunger-like”
- Nocturnal pain
- Nausea, anorexia, dyspepsia
- Gastrointestinal haemorrhage (melena)
- Weight loss

Symptoms of ulcers are characterized by rhythmicity and periodicity. Approximately half of the patients report relief of pain with food or antacids (especially duodenal ulcers) and a recurrence of pain 2-4 hours later. This is an important factor which must be taken into consideration while deciding the meal timings and frequency for the patient.

The treatment of the problem is based on:

- Alleviation of the underlying cause,
- Drugs (anti secretory, enhance mucosal defense),
- Providing relief from symptoms/complications, and
- Dietary management to promote a good nutritional status.

In the subsequent sub-section we shall learn about the essentials of dietary management during the various stages of peptic ulcers and also for the successful management of complications that may arise as a result of gastric surgery performed for the treatment of complicated cases of peptic ulcers.

## 6.2.2 Principles of Dietary Management

The dietary management regime of peptic ulcers has witnessed several changes. The most popular conservative diet therapy was the Sippy's diet wherein 6 small 1-2 hourly feedings comprising of mainly cream and milk were given to the patient. However, this resulted in the elicitation of nutritional disorders such as hypercholesterolemia, scurvy, alkalosis and tetany (Milk-Alkali Syndrome) to name a few. At present we are following a more liberal approach which was initiated by *Meulen Gracht*. We shall now discuss in detail the various aspects of dietary management for peptic ulcers. However, let us first identify the objectives of nutritional care for a peptic ulcer patient.

### *Objectives*

The objectives of nutritional care for a peptic ulcer patient include:

- to prevent further erosion and promote healing of the mucosal lining,
- to maintain an optimum pH in the alimentary tract,
- to coordinate acid secretion with food intake, and
- to correct nutritional deficiencies and promote a good nutritional status.

In light of the above mentioned objectives we shall discuss the requirements for various nutrients. We will first discuss the energy needs for the patient.

*Energy*: The requirements for energy should be based upon the existing health status of the patient. Majority of the patients are malnourished due to abdominal pain associated with food intake and to poor digestion/absorption. Thus, if the patient is ambulatory; it is recommended to increase the energy intake by about 10%. However, in case of hospitalized (bed-rest) patients; normal energy intake (as per RDI) would suffice for the extra needs. Providing 35 Kcal/kg IBW to promote weight gain may not be feasible during the active phase. This is generally recommended during the recovery stage (latent).

Let us now learn how to provide the recommended energy through various macronutrients viz. proteins, fats and carbohydrates.

*Proteins*: The protein intake should be increased by about 25% to 50% above the RDI. Proteins should be increased to:

- promote synthesis of new tissues and thus healing of eroded mucosa,
- replenish the blood proteins lost due to gastrointestinal bleeding, and
- provide buffering effect – since proteins have a longer intestinal transit time than carbohydrates.

High biological value proteins, which are at the same time easy to digest, should be provided. While eggs and washed pulses can be included liberally; meat and milk should be given in moderation (since calcium present in milk and meat stimulate acid secretion). Whole pulses and legumes, if given, should be in a soft cooked/ blended or pureed form (boiled, fermented, sprouted and steamed etc.). Protein supplements such as complan, casilan, Pro Mode, threptin biscuits may be included in the menus. Sprouts/dal khichdi, uttapam, idly, egg nog, soufflé, baked custard, puddings, poached/boiled egg, porridge, baked/steamed chicken/fish etc. (small serving) can be given to patient.

*Carbohydrates*: Nearly 60% of the total energy should be provided from carbohydrates to ensure maintenance of body weight and to ensure sparing of proteins for tissue synthesis. However, emphasis should be laid on foods rich in mono/disaccharides

and/or starches. The intake of dietary fibre, particularly insoluble fibre (husk, bran, peels etc.) should be avoided to prevent irritation to the ulcers. For the same reason food should be well cooked and blended/pureed to make it mechanically bland. Fruits should be steamed before serving. Care should be taken to exclude harsh sources of fibre such as seeds of citrus fruits and vegetables. Tomatoes if used as soups/purees can be tolerated in moderation (seeds get crushed). For the same reason wheat flour should be sifted through a fine mesh and whole cereal (bajra, jowar, ragi etc.) flours should not be included in the diet. Among the cereals rice, semolina, refined flour, sago, pasta, arrowroot/potato powder would be good options.

*Fat*: Nearly 20-25% of the total energy should be provided from fat because fat in any form delays gastric emptying, suppresses gastric acid secretion and motility. The quality of fat however should be selected according to the age and present health status of the patients. It is generally recommended to lay stress on emulsified fats and those rich in medium chain triglycerides (olive oil, coconut oil). Foodstuffs rich in emulsified fats (eggs, whole milk, cream, butter) are generally good sources of saturated fatty acids etc. Thus, middle aged ulcer patients, especially those at risk of developing coronary artery diseases, should lay greater emphasis on MCT's or vegetable oils rich in MUFA's/PUFA's rather than emulsified fats.

*Vitamins/Minerals*: The requirements of iron, calcium, and vitamin C increase during ulcers. While iron deficiency may arise due to bleeding; calcium reserves may get depleted (chronic cases) as milk/milk products are used in moderation. Fresh but cooked fruits and vegetables should be consumed in good amounts to get an adequate intake of vitamin C.

Besides the nutrient requirements discussed above, let us also review a few other considerations to be kept in mind while planning diets for ulcer patients.

#### *General Considerations*

The following general considerations need to be considered:

- Small, easy to digest meals should be given to the patient at very short intervals. An eight meal pattern is generally recommended during the acute phase while during recovery/latent phases, the patient should preferably adhere to a 5-6 meal pattern.
- Regular meal timings should be followed.
- The patient should be counseled to consume meals in a relaxed and calm environment.
- Fasting and long intervals between meals should be avoided.
- The meals should be chemically, mechanically and thermally bland i.e.:
  - Foods consumed should not stimulate gastric acid secretion. Thus, stimulating beverages such as tea, coffee, cocoa, carbonated drinks, spices, condiments, should be avoided. Patients may be given small servings of decaffeinated tea/coffee. Studies have shown that small amounts of condiments in the form of powder (cardamom) do not promote/aggravate acid secretion. Red and black pepper have been associated with mucosal damage and increased gastric acid secretion.
  - Mechanically irritating foods should be avoided as they may cause physical damage to the ulcerated regions. Thus, food rich in insoluble fibre should be avoided. Raw food should not be served. Similarly, alcoholic beverages (ethanol) may cause physical injury to the mucosal lining of the stomach and should therefore be avoided.

- Foods which are very hot/cold may stimulate acid secretion and should therefore be avoided.
- Certain foods (whole pulses, cauliflower, cabbage etc.) have been identified to be “gas formers” cause flatulence which may inhibit food intake. The effect may be individualistic and vary from one person to another, soaking of pulses overnight, sprouting/fermentation, as well as, employing boiling, pressure cooking, blending can help in reducing /alleviating the problem.
- Antacids should generally be take either an hour before meals or atleast 3 hours after meals.
- Smoking should be strictly restricted.

With this, we end our study of peptic ulcer. Next, let us get to know about ulcerative colitis and its dietary management.

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## **6.3 ULCERATIVE COLITIS**

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Ulcerative colitis is an idiopathic inflammatory condition that involves the mucosal surface of the colon, resulting in diffuse friability and erosions with bleeding. Let us recapitulate the pathophysiology of this disease condition.

### **6.3.1 Pathophysiology**

Look up Figure 6.16 in Unit 6 in the Applied Physiology Course (MFN-001) to recapitulate the structure of the colon. Yes, colon begins at the caecum and terminates at the rectum and anal canal. Approximately 50% of the patients have disease confined to the recto-sigmoid region; 30% extend to the splenic flexure (left-sides colitis); a less than 20% extend more proximally (extensive colitis). It occurs most frequently among individuals in the age group of 15 to 50 years; with a secondary peak at 50-60 years of age. In most patients, the disease is characterized by period of symptomatic flare-ups and remissions.

The treatment and management of this inflammatory bowel disease is individualistic and dependent upon the characteristic features during the acute and remissions phases. The major signs and symptoms include:

- Diarrhoea with blood
- Rectal bleeding/inflammation/tenderness
- Abdominal pain/cramps
- Faecal urgency
- Hypotension
- Anaemia (usually severe)
- Hypoalbuminemia
- Mild fever

The treatment of ulcerative colitis is enumerated next.

#### *Treatment*

Treatment of ulcerative colitis is targeted towards meeting the objectives of terminating an acute symptomatic attack and preventing recurrence. The most frequently adopted regime includes:

- Dietary modifications for both acute and remission phase
- Drugs (anti diarrhoeal/anti inflammatory and immunosuppressive agents)
- Surgery

In the subsequent section, we shall learn about the dietary management of patient suffering from ulcerative colitis during the phases of acute attack, as well as, remission.

### 6.3.2 Principles of Dietary Management

Malnutrition is very common among most patients suffering from ulcerative colitis. Repeated episodes of acute and remission phase deplete the nutritional reserves immensely which in turn makes the patient more vulnerable to subsequent episodes of inflammation, diarrhoea and bleeding. The potential nutrition related problems associated with ulcerative colitis include:

- anaemias related to bleeding and poor food intake,
- malabsorption due to diarrhoea,
- reduced food intake related to nausea, bloating and abdominal pain,
- food aversions, anxiety and fear of eating related to experiences with abdominal pain, bloating, vomiting and diarrhoea,
- true /perceived food intolerance,
- self-imposed dietary restrictions, and
- weight loss, macro/micronutrient deficiencies.

In view of the above nutritional implications, we shall now discuss the nutrient requirements and dietary modifications for patients during acute and remission phases of ulcerative colitis. But first let us review the objectives of nutritional care for ulcerative colitis patient.

#### *Objectives*

The objectives of nutritional care for ulcerative colitis patient include; to help in man:

- to help in managing/alleviating symptoms such as diarrhoea
- to maintain a positive nitrogen balance
- to help in replenishing the depleted reserves of vitamins, minerals and electrolytes
- to prolong the phase of remission and hence delay the frequency/severity of acute attacks
- to promote the management of clinical complications such as anaemia
- to prepare the patient for surgery (if required)
- to maintain a good nutritional status.

Now let us start with the energy requirements.

*Energy:* Patients are generally in a negative energy balance due to poor appetite and diarrhoea. Majority of the patients are ambulatory and tend to lose some weight due to repeated episodes of acute attack. During the acute phase, the patient is usually on a low energy, liquid diet (parenteral or enteral nutrition). Whereas, during the remission phase, the patient should be advised to consume energy as per the RDI or that sufficient to maintain an ideal body weight. Thus, the energy intake may vary from 25-35 Kcal/kg IBW.

*Protein:* In view of the inflammation, anaemia and hypo-albuminemia, the protein requirements increase. Adequate intake of protein is essential, particularly if the patient is a candidate for surgery. Adequate intake of protein would also help in alleviating malnutrition which is related to compromised digestive/absorptive function and increased permeability of the GI tract to potential inflammatory agents.

The proteins intake should therefore be increased by 25% to 50%. Although emphasis should be laid on high biological value proteins; they can be provided from a variety of sources. If no food intolerance has been identified; include good amounts of egg, meat, poultry, marine foods, washed pulses, legumes. In view of the restrictions in particle size, it may be imperative to include whole pulses in a soft cooked blenderized form. Some patients may experience flatulence associated with the intake of milk, in such cases, milk may be avoided as a beverage but may be used in the form of milk products.

*Carbohydrate:* The quantity of carbohydrate to be provided through the diet should remain the same as far a healthy adult. Low residue, low fibre diets are occasionally helpful because of their role in modifying the microbial load in the colon. Emphasis should be laid on the inclusion of easy to digest carbohydrates i.e. mono/disaccharides and polysaccharides; principally starches. High fibre cereals should be avoided. Thus, the patient may be given adequate amounts of semolina, rice, refined flour, sago, arrowroot, breads/buns/pastas, potatoes, sweet potatoes, yam, colocasia, starchy fruits (banana, mangoes) sugar, jaggery, dextrose etc.

*Fat :* Nearly 20% of the total energy should be provided from fat. Emphasis should be laid on n-3 fatty acids ( $\alpha$ -linolenic acid, eicosapentaenoic acid and decosahexaenoic acid) in view of their anti inflammatory effect. Foods rich in n-3 fatty acids include marine food (such as salmon, mackrel, halibut, tuna, herring) and cod liver oil, flax-seed oil, olive oil, soya bean oil, wheat germ and oil. The patient should incorporate good amounts of well cooked/ blenderized soyabean - its products such as temphe, miso, soyamilk, tofu etc. Emulsified fat should be the second option of choice and fried foods should be completely omitted.

*Vitamins and Minerals:* Deficiencies of vitamin D,K,C, B<sub>12</sub>, folate, calcium, magnesium, zinc, sodium and potassium are usually present due to poor food intake, poor absorption and bleeding from the inflamed mucosal surface of the colon. Thus, good amounts of well cooked (boiled, steamed, pressure cooked) low fibre fruits and vegetables in the form of purees, soups, well blended juice, stewed fruits, fruit jellies, milk shakes can be incorporated in the diet.

*Fluids:* Deydration resulting in hypovolemia/hypotension is frequently observed during the active phase of ulcerative colitis. While earlier emphasis used to be laid on parenteral nutrition, now-a-days patients are able to tolerate enteral nutrition and/or oral intake of liquid diet. Clear fluids supplemented with medium chain triglycerides are helpful during acute and severe exacerbations of the disease. Inflammation/scarring may result in a partially obstructed bowel and thus fibre may have to be restricted or limited to minute particles to pass through the narrowed lumen. Small amounts of isotonic, liquid, oral supplements may be valuable in restoring intake without provoking symptoms.

### *Special Considerations*

In everyday life, patients may have intermittent “flares” of the disease. Patients therefore need to counsel regarding proper management of their diseases. Some important dietary considerations include:

- Small frequent easy to digest meals should be given to the patient.
- The meals/beverages should have a small particle size. A low to moderate fibre diet is recommended during the latent phases while a low residue diet may be beneficial during the active stages or if abdominal discomfort is severe.
- Prebiotic foods (oligosaccharides, fermentable fibres and resistant starches) can be helpful in attenuating the inflammatory process.
- Probiotic foods such as sauerkraut, yoghurt, spirulina, alfa-alfa, organic barley/wheat grass and certain fermented drinks can help in prolonging the period of remission.



- Food should be well cooked and preferably have a small particle size. Blending, pressure cooking, steaming, stewing, summering, baking should be the preferred methods of cooking.
- Commercially available fibre supplements decrease diarrhoea and rectal symptoms such as psyllium: 3-4 g twice daily, methylcellulose: 2.0 g twice daily.

Before we end our study on ulcerative colitis, we would like you to review a sample menu for the acute and the remission phase of the ulcerative colitis condition. These menus will help you in planning diets and menus for ulcerative colitis patients.

### Sample Menu – Ulcerative Colitis

Acute Phase	
7.00 a.m.	: Sugar Cane juice Arrowroot biscuits
9.00 a.m.	: Rice kanji Half boiled egg Fruit jelly
11.00 a.m.	: Strained fruit juice Boiled potato
11.30 p.m.	: Vegetable soup Moong dal sago puree
3.00 p.m.	: Fruit yoghurt
5.30 p.m.	: Strain carrot juice
7.30 p.m.	: Cream of potato soup Blended massoor dal and rice khichdi
9.00 p.m.	: Sweet mango lassi
11.00 p.m.	: Custard

Remission Phase	
<b>Early Morning:</b> Lemonade/sugarcane juice Arrowroot biscuit	<b>Early Evening Tea:</b> Carrot kanji Cake/muffin
<b>Breakfast:</b> Poached egg Soya milk Vegetable (steamed ) upma	<b>Late Evening:</b> Fruit jelly with cream
<b>Mid-Morning:</b> Sweet lassi Potato dumpling	<b>Dinner:</b> Pulse/Meat/Chicken Preparation (blended) Pumpkin subzi (blended) Rice or Khichdi (blended)
<b>Lunch :</b> Vegetable soup Steamed fish/Boiled Potatoes Sprouted pulse and rice khichdi (blended) Baked custard	<b>Post Dinner:</b> Rice pudding Steamed mango

From ulcerative colitis we move on to lactose intolerance which is a malabsorption syndrome. Let's find out about the nutritional management of this condition.

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## 6.4 LACTOSE INTOLERANCE

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Lactose intolerance is categorized as a *Malabsorption Syndromes*. The term 'malabsorption syndrome', as you have learnt earlier in the theory course (MFN-005) in Unit 14, sub-section 14.2.8, is used to describe deficient absorption to a variable degree of a number of substances such as fats, proteins, carbohydrates, vitamins, minerals and water. *Lactose intolerance* relates to insufficiency of the disaccharidase 'lactase' which is found in the greatest quantity in the outer membrane of the mucosal cell of the jejunum. Lack of lactase does not break down the disaccharide sugar, *lactose in milk, to glucose and galactose*, which hence passes unchanged into the large intestines where it gets converted to lactic acid by the bacteria, which subsequently causes diarrhoea and other symptoms of discomfort, and distension, abdominal pain. The problem is gene related and often seen in infants and young children commonly but may also be present in adults.

The dietary treatment is based upon the determination of lactase activity as the treatment depends on the level of activity of lactase enzyme. Let us focus on the nutritional management next.

### *Nutritional Management*

Diagnostic tests are available that can give information about the level of lactase activity of the lactase enzyme. Depending on the level of activity (very low level, moderate level) the dietary treatment could be planned. Let us see how.

- *Very low level of lactase activity*: At very low level of lactase activity all milk products must be eliminated substitutes of milk like soya milk, groundnut milk and their preparations could be given. Enzyme such as Lactaid and Maxilact are available in the market. Addition of these in the milk or milk products could digest 90% of lactose in milk and thus minimize the symptoms of lactose intolerance.
- *Moderate level of lactase activity* : Intake of milk is restricted depending on the tolerance. Fermented and cooked form of milk preferred as it is better tolerated. Fermentation converts a major part of Lactose to Lactic acid and in cooked product lactose gets bound and the concentration reduces. It is better tolerated in the form of buttermilk, curds, custards, porridges and cottage cheese or when mixed with cereals, cocoa etc. These allow gradual lactose breakdown and decrease the symptoms of lactose intolerance. Curds are better tolerated possibly due to microbial culture that facilitates lactose digestion in the intestine. Small amount of milk can be taken with the meal.

Lactose is present in dairy products such as milk, cheese, yoghurt, ice cream etc. Hidden sources of lactose may include bread, candy, cookies, biscuits, sauces, gravies, soups etc. Hence, depending upon the amount of lactose an individual can handle, major or minor dietary restrictions may be imposed.

Because dairy products are restricted or avoided, which are a major source of calcium, which children need to develop strong bones, it is important to serve calcium-rich foods to make up for the loss. Tofu, broccoli, pulses (Bengal gram whole, horse gram, rajmah), nuts and oilseeds, green leafy vegetables (particularly amaranth, fenugreek), fish and sea foods are excellent sources of calcium.

To help you remember the important aspects, some handy tips are enumerated herewith.

**Remember :**

- Identify the level of lactase activities (diagnostic tests)
- Depending on the enzyme activity eliminate milk and milk products
- Substitute milk and milk products by giving soya sources like – tofu, soymilk, soy curd and groundnut milk
- Give a well balanced diet
- If moderate lactase activity is present small amounts of lactose (within individuals tolerance level) can be given several times a day
- Small amounts in moderate lactose activity can be tolerated if taken with other foods e.g. after a meal or a snack
- Curds is better tolerated than milk
- In case low lactose foods available commercially like ice cream, cottage cheese try them
- Lactose enzymes are available these should be added in the milk
- Deficiency of lactose and calcium could be supplemented by giving other foods rich in the same

With this we end our study of gastrointestinal disorders.

There are three activities included in this practical. We shall practice and learn how to plan diets during the peptic ulcer and during the acute and remission phases of ulcerative colitis in the first two activities. The third activity deals with diet planning for lactose intolerance. Before you move on to these activities, do check your understanding on this topic by answering the review exercises included next. These are self-check exercises.

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## 6.5 REVIEW EXERCISES

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1) How are gastric ulcers different from duodenal ulcers?

**Gastric Ulcers**

**Duodenal Ulcers**

.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

2) Why should we lay emphasis on providing a mechanically soft diet to patients suffering from ulcers?

.....

.....

.....

.....

.....

- 3) Mentioned below is a meal (lunch) being prepared for Rama's family. Rama is suffering from peptic ulcers. Help his wife by giving suggestions regarding appropriate modification (s) of the existing meal menu so as to make it appropriate for Rama.

**Present Meal Menu**

**Modified Menu**

Cabbage Carrot Tomato Salad

Fried fish curry

Spinach chappati

Bajra kheer

Suggestions regarding cooking/serving methods:

- 4) What is ulcerative colitis?

.....  
.....  
.....

- 5) Give the requirement for the following nutrients for a patient suffering from peptic ulcer and for a patient suffering from ulcerative colitis.

**Peptic Ulcer**

**Ulcerative Colitis**

Energy (Kcal)

Protein (g)

Carbohydrates (g)

Fats (g)

Minerals and Vitamins

- 6) What special considerations will you keep in mind while planning a diet for an ulcerative colitis patient?

.....  
.....  
.....

- 7) Lactose intolerance is caused due to the insufficiency of which enzyme and what are its consequences.

.....  
.....  
.....  
.....

- 8) Which foods need to be avoided from the diet of a patient suffering from lactose intolerance? Enumerate.

.....  
.....  
.....

Now carry out the activity included in this practical.

**DIET PLAN FOR PEPTIC ULCER**

**Aim** : To plan a diet for a patient suffering from peptic ulcer.

Date :

**Case Study** : Kapila is a 37 year old news reporter who was admitted two weeks back complaining of constant radiating pain in the epigastrium. She had been diagnosed to be suffering from ulcers about a year back. Of late she had been complaining of nocturnal pain. Laboratory examinations have indicated anaemia, mild leukocytosis and general malnutrition. Kapila's height is 5'4" and her usual weight has been 53 kgs. At present she weighs 49 kgs. Endoscopy and other imaging tests have indicated perforation of ulcers and she has been diagnosed to be suffering from gastric ulcers. Kapila was initially put on enteral tube feeds and is presently being given a high energy, high protein bland soft diet. She has also been prescribed drug therapy. Her condition is being monitored for subsequent gastrointestinal bleeding/perforations. At present her condition is stable and she is on stage II diet.

Kapila is suffering from an advanced stage of peptic ulcers. At present her condition needs to be managed carefully. Both the consistency and composition of diet need to be such so as to prevent further damage to the mucosal lining and at the same time promote healing. Keeping this in mind, proceed towards planning a diet for Kapila, following the instructions given in this activity.

**Introduction**

(Present a brief write up on the disease condition in the space provided herewith).

**Step I: Identify the case details**

*Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Based upon the clinical condition identify the nutritional implications affecting her health status.

	<b>Symptom / conditions</b>	<b>Nutritional Implications</b>
1)		
2)		
3)		
4)		
5)		
Diet prescribed:		

*Objectives of Nutritional Care*

(Identify the objectives of nutritional care related to the present disease conditions of Kapila. Refer to sub-section 6.2.2 earlier and write the objectives here in the space provided).

**Step II: Assess and compute the nutritional requirements**

Calculate the requirements and record them in format given below. Now compare them with the RDI for a healthy sedentary adult woman. (Refer to Table 1.1, Practical 1).

**Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Iron (mg)		
Vitamin C (mg)		
Vitamin A (I.U.)		
Dietary Fibre (g)		
Crude Fibre (g)		

### Calculations:

#### Step III: Select the food exchanges

On the basis of the modified RDI and clinical condition, select the food exchanges for Kalpila that can help to promote recovery. Record them in the format given herewith.

Exchange	No.	Energy(Kcal)	Protein(g)	Carbohydrate(g)	Fat(g)
Whole Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat					
Sugar					

#### Step IV: Distribute the exchanges

Identify an appropriate meal pattern for Kapila and distribute the exchanges for providing balanced nutrition throughout the day in the format given herewith.

Exchange	No.	Early Morning	Breakfast	Mid Morning	Lunch	Evening Tea		Dinner	Post Dinner
						Early	Late		
Whole Milk									
Meat									
Pulse									
Cereals									
Roots/Tubers									
Other Vegetables									
GLV									
Fruit									
Fat									
Sugar									

(Note: You may modify the meal pattern as per your discretion).

**Step V: Plan a day's menu for Kapila**

In accordance with exchanges available for each meal plan in menu. Lay emphasis of planning nutrient dense, easy to digest bland meals. Remember, the consistency of diet plays an equally important role as the composition in determining the outcome of peptic ulcers.

**Sample Menu for Kapila**

*Early Morning*

*Breakfast*

*Mid Morning*

*Lunch*

*Evening Tea (Ist)*

*Evening Tea (IInd)*

*Dinner*

*Post Dinner*







### Conclusion

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

<b>Nutrient</b>	<b>Modified RDI</b>	<b>Detailed Diet Plan</b>	<b>± % of Difference</b>	<b>Suggestions for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
Crude Fibre (g)				
Dietary Fibre (g)				
Iron (mg)				
Vitamin A (I.U.)				



**Submit the activity for evaluation.**

\_\_\_\_\_  
**Counselor's Signature**

**DIET PLAN FOR ULCERATIVE COLITIS**

**Aim** : To plan a diet for a patient suffering from ulcerative colitis.

Date :

**Case Study** : Mr. Narang is a 53 years old sedentary office worker weighing 52 kgs. (height 5ft. 6 inches) who is fond of consuming baked and fried snacks in the evening. About two years back, his weight was 71.5 kgs. He was admitted to the general ward of a government hospital complaining of severe lower abdominal pain and rectal bleeding along with diarrhoea. Sigmoidoscopy confirmed that he is suffering from an acute phase of ulcerative colitis. His medical reports indicated that he was diagnosed to be suffering from colitis about 2½ years back. His biochemical physical and imaging reports indicate the following:

Haemoglobin	: 8.3 g/dl
Pulse	: 92 per minute
Haematocrit	: 33%
ESR	: 29 mm/hr
Albumin	: 3.0 g/dl

He was immediately given blood transfusion. Intravenous therapy followed by enteral tube feedings helped in preventing dehydration and a sharp decline in the existing nutritional status. His condition is presently stable and he has been prescribed a nutrient dense semi-soft diet. His oral intake was started a week before wherein clear fluids and full fluids devoid of mechanical irritants were given. He is presently on micronutrient supplements and drugs to inhibit inflammation.

Keeping this in mind, now plan a diet for Mr. Narang, following the instructions given in this activity.

**Introduction**

(Present a brief write up on the disease condition in the space provided herewith).

Identify the key clinical symptom of Mr. Narang which may affect his nutritional status.

**Symptoms****Implications on Nutritional Status**

- 1)
- 2)
- 3)
- 4)
- 5)

### Step I: Patient's Profile

Read the case details and fill in the patient details in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

#### *Clinical Profile*

Body weight

Haemoglobin

Pulse

Haematocrit

ESR

Albumin

*Patient Value*

*Normal Value*

### Step II: Assess/compute the nutritional requirements

Calculate the nutrient requirements during the recovery phase and compare them with the RDI recommended for a sedentary healthy adult man.

#### **Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Iron (mg)		
Folic acid ( $\mu$ g)		
Calcium (mg)		
Dietary Fibre (g)		
Crude Fibre (g)		

*Show your Calculations here:*

### Step III: Select the food exchanges

Several modifications are required in the quantity and quality of nutrients which need to be provided to the patient. These changes in turn affect the choice of foodstuffs required for planning and preparing meals. Based upon the modified RDI, select the most appropriate food exchanges suitable for Mr. Narang.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Whole Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
GLV					
Fruit					
Fat					
Sugar					

### Step IV: Plan a menu

As per the clinical details mentioned in the case Mr. Narang was admitted to hospital during an acute attack of ulcerative colitis during which a semi-soft cum full fluid diet is given. However, at present Mr. Narang is on a soft diet. Plan suitable menu's for a day for :

- Acute phase
- Recovery phase (based upon the food exchanges available)

#### Menu for Acute Phase

**Menu for Recovery Phase**

*Early Morning*

*Breakfast*

*Mid Morning*

*Lunch*

*Early Evening*

*Late Evening*

*Dinner*

*Post Dinner*

**Step V: Distribute the food exchanges**

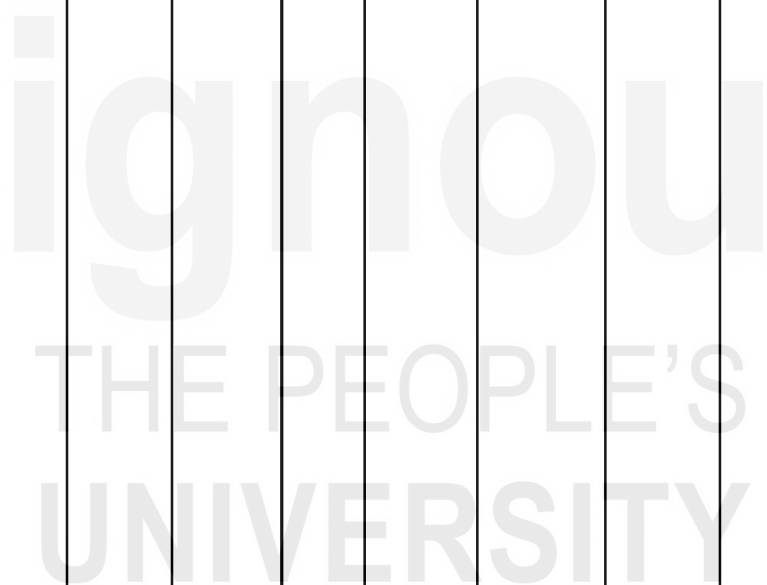
Identify an appropriate meal pattern for Mr. Narang for the recovery phase and distribute the above selected exchanges so as to provide a balanced meal throughout the day.

<b>Exchange</b>	<b>No.</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Carbohydrate (g)</b>	<b>Fat (g)</b>
Whole Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetable					
GLV					
Fruit					
Fat					
Sugar					

**Step VI: Detailed menu plan**

(Give the detailed menu plan in the format given herewith).

<b>Meal</b>	<b>Menu</b>	<b>Ingredients</b>	<b>Amt (g)</b>	<b>Exch- ange</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Iron (mg)</b>	<b>Calcium (mg)</b>	<b>Folic Acid (µg)</b>	<b>Dietary Fibre(g)</b>
<b>Total</b>										



**Conclusion**

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

<b>Nutrient</b>	<b>Modified RDI</b>	<b>Detailed Diet Plan</b>	<b>± % of Difference</b>	<b>Suggested for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
Crude Fibre (g)				
Dietary Fibre (g)				
Iron (mg)				
Vitamin A (I.U.)				

**Submit the activity for evaluation.**

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**Counselor's Signature**



**DIET PLAN FOR LACTOSE INTOLERANCE**

**Aim** : To plan a diet for a patient suffering from lactose intolerance.

Date :

**Case Study** : Meenu is 14 year old girl who complains of periodic diarrhoea since past few years. She weighs 25 kg. No recent weight change has been recorded. Routine medical and clinical examination is normal. A lactose load of 40 g gives a maximal rise of blood sugar.

Her physician diagnosed her condition as lactose intolerance and refers her to a dietitian for nutritional management of her condition.

Now based on the case study plan and calculate a diet for Meenu following the instructions given herewith.

**Introduction**

(Briefly elaborate on Meenu's disease condition and on the significance of the nutritional management of her condition in the space provided herewith).



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**Step I: Patient's Profile**

(Read the case details and fill in the patient details in the format given herewith).

***Patient/Case Profile***

Name:

Age:

Gender:

Activity:

Dietary habits:

Pathophysiological stress:

Diet prescribed (suggest the diet you would recommend):

**Step II: Assess/compute the nutritional requirements of Meenu**

(Keeping the disease condition in mind compute the nutrient requirement of Meenu and compare them with the RDI recommended for a 14 year old healthy girl ).

**Recommended Dietary Intake**

Nutrient	Normal	Modified
Energy (Kcal)		
Protein (g)		
Calcium (mg)		

**Step III: Select the most appropriate food exchanges suitable for Meenu**

(Several modifications are required in the quantity and quality of nutrients which need to be provided to the patient. These changes in turn affect the choice of foodstuffs required for planning and preparing meals. Based upon the modified RDI, select the most appropriate food exchanges suitable for Meenu and write these in the format given herewith).

Exchange	No.	Energy(Kcal)	Protein(g)	Carbohydrate(g)	Fat(g)
Milk (Lactose Free)					
Cereals					
Roots/Tubers					
Meat					
Pulse					
Other Vegetables					
GLV					
Fruit					
Fat					
Sugar					

**Step IV: Distribute the above selected exchanges according to the meal pattern most suitable for the patient.**

Exchange	No.	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	After Dinner
Milk (Lactose free)							
Cereals							
Roots/Tubers							
Pulses							
Meat							
Leafy Vegetables							
Other Vegetables							
Fruits							
Sugar							
Fat							
<b>Total</b>							

**Step V: Plan a menu for Meenu**

(As per the selected exchanges in step IV above plan a suitable menu's for a day for Meenu in the space provided herewith. You may decide on a different meal pattern than the one given in the format herewith and accordingly plan a menu).

**Menu for Meenu**

Breakfast	Mid Morning	Lunch	Evening Tea	Dinner	After Dinner



### Conclusion

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

Nutrient	Modified RDI	Detailed Diet Plan	$\pm$ % of Difference	Suggested for Improved Intake
Energy (Kcal)				
Protein (g)				
Calcium (mg)				

### Dietary Counseling Points

List the foods which you would recommend to be avoided in the diet of Meenu

List the foods which can be substituted and included in the diet of Meenu to ensure good health

Submit the activity for evaluation.

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Counselor's Signature

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# PRACTICAL 7 NUTRITIONAL MANAGEMENT IN LIVER, GALL BLADDER AND PANCREATIC DISEASES

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## Structure

- 7.1 Introduction
- 7.2 Liver, Gall Bladder and Pancreatic Diseases: An Overview
- 7.3 Diseases of the Liver: Pathophysiology and of Dietary Management Principles
  - 7.3.1 Infectious Hepatitis
  - 7.3.2 Liver Cirrhosis
- 7.4 Diseases of Gall Bladder
  - 7.4.1 Principles of Dietary Management – Cholelithiasis/Cholecystitis
- 7.5 Diseases of the Pancreas
  - 7.5.1 Principles of Dietary Management – Pancreatitis
- 7.6 Review Exercises

*Activity 1: Diet Plan for Hepatitis*

*Activity 2: Diet Plan for Liver Cirrhosis*

*Activity 3: Diet Plan for Cholelithiasis/Cholecystitis*

*Activity 4: Diet Plan for Pancreatitis*

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## 7.1 INTRODUCTION

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In the previous practical we learnt about the dietary management of the diseases associated with the gastrointestinal tract. In this unit we will discuss about the diseases of the liver, gall bladder and pancreas. Hepatitis, cirrhosis, cholecystitis/cholelithiasis and pancreatitis are the major diseases which will be discussed in this practical. We will begin with a brief on the pathophysiology (impact on nutritional status), characteristic symptoms of the above mentioned diseases and thereafter focus on the various aspects of dietary management. The activities included in this practical will help us to understand and learn about the applied aspects related to working out a day's diet for each disease. Before you begin, we suggest you look up the concepts related to the pathophysiology and principles of diet planning related to these disease already covered in the theory course (MFN-005) in Unit 15.

### Objectives

After undertaking this practical, you will be able to:

- discuss the diseases of the liver, gall bladder and pancreas,
- describe the various aspects of dietary management of the liver, gall bladder and pancreas diseases, and
- plan diets for hepatitis, cirrhosis, cholecystitis/cholelithiasis and pancreatitis.

## 7.2 LIVER, GALL BLADDER AND PANCREATIC DISEASES: AN OVERVIEW

Nutritional support plays a major role in the clinical management of patients with liver, pancreas and biliary disease(s). It has widely been recognized that malnutrition adversely affects outcome in both chronic and acute form of diseases of the liver, gall bladder and/or arise in patients with chronic forms of hepatobiliary and pancreatic disorders. Thus, the objectives of the nutritional support shall be to provide nutrient in the correct quantity and form, to restore and maintain nutritional status, correct specific deficiencies, treat clinical symptoms and promote regeneration of the lost tissues.

Wide spectrums of diseases are associated with the insufficiency and/or dysfunction of liver, gall bladder and pancreas and the most important ones include:

<b>Liver</b>	<b>Gall Bladder</b>	<b>Pancreas</b>
– Acute viral hepatitis	– Cholecystitis	– Acute pancreatitis
– Liver cirrhosis	– Cholelithiasis	– Chronic pancreatitis
– Hepatic Encephalopathy or Hepatic Coma		– Cystic fibrosis
		– Tumors
		– Pancreatic abscesses
		– Fistulas

Let us briefly recapitulate the pathophysiology, symptoms and dietary management related to these disorders.

## 7.3 DISEASES OF THE LIVER: PATHOPHYSIOLOGY AND DIETARY MANAGEMENT PRINCIPLES

Liver is a vital organ required for our survival. It is required for the proper metabolism of proteins, carbohydrates and fat. Liver is involved in the storage, activation and transport of many vitamins and minerals such as vitamin A, D, B<sub>12</sub>, zinc, iron, copper, magnesium etc. It also plays an important immunological and detoxification functions. Diseases of the liver can be acute or chronic, inherited or acquired. The most common one's being hepatitis (acute, fulminant, chronic, alcoholic), cirrhosis, hepatic encephalopathy. The major pathological changes associated with liver diseases are atrophy, fatty infiltration, fibrosis and neurosis of the hepatic cells.

*Jaundice* which is synonymously used for hepatitis is actually a *symptom* common to all liver diseases and is characterized by elevated levels of bilirubin in the blood. Hyperbilirubinemia may be due to abnormalities in the formation, transport, metabolism and excretion of bilirubin. Normal plasma bilirubin levels are 2-8 mg/litre. Clinical signs of jaundice generally appear when the plasma concentrations are between 8-20 mg/litre.

We have already discussed in Unit 15 (in the Theory Manual) the clinical details and etiological factors for some commonly encountered diseases of the liver. In this section we will, therefore, recapitulate the pathophysiology and the dietary management principles for the liver diseases.

Let us first learn about hepatitis.

### 7.3.1 Infectious Hepatitis

Infectious hepatitis, you may recall studying, is a disease characterized by inflammation and degeneration of the liver cells. Hepatitis may occur due to reactions with drugs, toxic agents and various viruses. The most common form of hepatitis is that caused

by faecal contamination of food and water with Type A virus. Serum hepatitis (Type B) is next most frequently occurred form.

As for the symptoms, mild constant abdominal pain, malaise, easy fatigability, upper respiratory symptoms, anorexia, nausea, frequent episodes of vomiting along with diarrhoea or constipation may occur during the initial stages. Jaundice occurs in 5-10 days and there is worsening of the above mentioned symptoms. In the convalescent phase, increasing sense of well being, return of appetite along with reduction in the severity of jaundice, abdominal pain, tenderness of liver and fatigability is experienced.

While the above mentioned symptoms may subside in 2-8 weeks; complete recovery takes a long-time. Majority of the symptoms associated with the term 'jaundice' adversely affect the food intake. Further, patient may also experience low grade fever thereby increasing the nutritional demands on the body. Efficient treatment and management of hepatitis is a must to prevent its progression towards cirrhosis/ hepatic encephalopathy etc. Let us then study about the treatment of hepatitis.

#### *Treatment*

The treatment focuses on:

- Dietary management to maintain a good nutritional status.
- Bed rest or avoidance of strenuous physical activity.
- Drugs, if required (non-metabolism).
- Avoidance of hepatotoxic agents particularly alcohol.

Let us focus on the dietary management of hepatitis next.

#### ***Dietary Management of Hepatitis***

Irrespective of the cause of hepatitis, regeneration of the lost liver cells is essential to promote recovery and hence promote proper functioning of the organ. Relapse of hepatitis or progression of acute hepatitis to a chronic form/cirrhosis occurs many-at-times due to impaired nutritional status. Liver being a store house for several nutrients (particularly vitamins/minerals), the nutritional reserves may get depleted during hepatitis. Thus, the major objectives of dietary management include:

- to promote a positive energy and nitrogen balance,
- to promote recovery and prevent progression of the disease,
- to replenish the depleted reserves, and
- to ensure satisfactory convalescence and maintain an optimum nutritional status.

We will now discuss the nutrient modifications necessary to promote quick recovery and prevent further degeneration of hepatic cells. Let us start with the calorie requirement.

*Energy:* Majority of the patients experience weight loss and are malnourished due to reduced food intake. Low grade fever is generally present during viral hepatitis which also imposes increased demands for calories due to an increase in basal metabolic rate. Adequate energy intake is also essential to ensure proper utilization of proteins. The energy requirements may increase by 15 to 30% depending upon the existing nutritional status. However, the energy intake should be increased gradually. An aggressive increase in energy results in aggravating gastrointestinal disturbance. Due to severity of jaundice during the early stages it may not be feasible to provide more than 1200 Kcal per day. However, during the convalescence phase, adequate intake of energy is feasible and a must to ensure complete recovery. If the patient is grossly underweight, the energy intake may be calculated as 35 Kcal/kg IBW to ensure weight gain and replenishment of glycogen reserves.



**Protein:** The protein intake should be increased by 50% to 100% in mild and moderate cases of hepatitis i.e. the patient should be given 1.5 to 2.0 gm protein per kg IBW per day. However, if hepatitis is severe and there is risk of developing cirrhosis; the protein intake should not exceed 1.0 g/kg IBW/day i.e. the protein should be provided as per the RDI.

**Fat:** Fats should not be severely restricted as they can make the food unpalatable. About 20% of the total calories should be from fat. MCTs are preferred as they are easily digestible and assimilable (40-50 g). For example, dairy fat cream and butter are preferable.

**Carbohydrates:** In mild and moderate cases of hepatitis, carbohydrates should provide atleast 60% of the total energy. Liberal intake of carbohydrate helps in replenishing the glycogen reserves and sparing the proteins for tissue regeneration. However, in severe chronic hepatitis determining the carbohydrate needs is often a challenge because liver failure reduces glucose production, glucose utilization and there is preference for the use of lipids and proteins as alternative sources of protein. In such situations the carbohydrate intake should not exceed 60% of the total energy. Emphasis should be laid on the inclusion of food rich in monosaccharides, disaccharides and starches. Dietary fibre intake should be kept minimum. All fibre rich foods should preferably be avoided and if given, should be in a soft cooked form. Thus, include good amounts of glucose, dextrose, jaggery, honey, sugar, ago, rice, refined four, pastas, starchy roots and tubers (potato, yam, colocasiac etc.), high carbohydrate fruits (banana, mango, sapota, raisins etc.)

**Vitamins and Minerals:** Impaired liver function and its associated symptoms can result in increased demand of B-group vitamins, ascorbic acid, vitamin A, K, calcium, and iron. Among all the nutrient, fat malabsorption is the greatest, therefore  $\beta$ -carotene rich foods should be included in the diet. Include adequate amount of fresh fruits and vegetables in soft cooked form such as mashed pureed vegetables, vegetable soup, fruit juice, stewed fruit, fruit jellies, fruit jam, milk shakes, etc.

**Fluids:** Fluid intake may need to be increased if the patient is suffering from diarrhoea and/or constipation. In such cases include good amounts of clear and full-fluids in the diet such as:

- a) **Clear fluids:** Coconut water, tea/coffee (without milk,) barley water, strained vegetable/ pulse/ meat soup, strained fit juices, strained carrot/rice kanji etc.
- b) **Full fluids:** Milk based beverages such as tea, coffee, milk shake, soufflé, baked custard, soup, juice, egg nog, fruit jellies etc.

### General Considerations

The other considerations include:

- High energy high protein diet should be given to patients suffering from mild to moderate hepatitis.
- During acute hepatitis or if vomiting/diarrhoea is severe, a full fluid or a semi-soft diet may need to be given.
- Small, frequent, easy to digest bland meals should be served to the patient. The meals should particularly be mechanically and chemically bland.
- Since patients experience nausea and anorexia, it is essential to prepare palatable meals which are attractively served. Inclusion of variety in terms of colour, texture, taste, flavour and mouth feel is important to motivate the patient (particularly children) to consume food.
- Moist heat methods of cooking such as boiling, pressure cooking, stewing, steaming should be preferred over dry heat methods such as roasting, grilling etc.

<b>Early Morning</b> One cup milk Cake slice (one)	<b>Lunch/Dinner</b> Chicken /Vegetable soup Washed moong dal/arhar/masoor
<b>Breakfast</b> Boiled or poached egg Cornflakes porridge or suji porridge Stewed apple (without peels ) with honey	Ridge gourd/pumpkin or tinda potato sabji Rice/Chapati Spinach burfi/phirni/custard/ice-cream
<b>Mid-Evening</b> Sugarcane pineapple juice Muffin or dhokla	<b>Evening Tea</b> Milk shake/orange soufflé vegetable and sprouts upma.

We shall now brief ourselves about the dietary management of liver cirrhosis which is a more serious form of liver diseases and if not treated promptly can result in irreversible changes leading to death of the patient.

### 7.3.2 Liver Cirrhosis

Liver cirrhosis is the end result of hepato-cellular injury wherein the fibrous connective tissue replaces the functioning liver cells. It is a serious form of end-stage liver disease wherein the liver loses majority of its functional capacity.

Hepatic encephalopathy may develop if cirrhosis is not treated properly and is characterized by day-night reversal, tremor, dysarthria, delirium and ultimately coma. Thus, proper treatment of cirrhosis is very crucial and is highlighted next.

#### *Treatment*

The treatment of cirrhosis includes:

- Dietary management as per the changing needs of the patient.
- Drugs treatment.

Next, let us identify the objectives and elaborate upon the principles of dietary management for cirrhosis.

#### ***Dietary Management of Cirrhosis***

Dietary modifications during liver cirrhosis should be based upon the symptoms and etiological factors.

- to maintain energy and nitrogen balance,
- to promote regeneration of hepatic cells,
- to replenish depleted nutritional reserves and maintain an optimum nutritional status,
- to cure the underlying cause, and
- to promote recovery and prevent progression of the disease.

Let us now focus on the modifications required in the quantity and quality of various nutrients. We shall begin with the calorie requirements of the patient.

**Energy:** Majority of the patients are on complete bed rest and moderately/severely malnourished. Since the actual body weight of the patient may be difficult to record due to oedema; it is advisable to use usual body weight or ideal body weight for calculating the energy requirements of the patient. Most of the patients would benefit on a diet providing calories as per the RDI (ICMR) or 30 Kcal per kg ideal body weight or usual body weight.

**Protein:** Cirrhosis is a catabolic disease characterized by increased protein breakdown and inadequate synthesis. The detoxification functions also get impaired. During uncomplicated stable cirrhosis, the protein requirements remain 1.1-1.2 g per kg IBW or usual body weight. If there is risk of impending coma (Grade I-II), we should keep the protein intake below 0.8-1 g/kg ideal or usual body weight. However, if signs of impending coma (Grade III-IV) appear, the protein intake should be reduced till the ammonia level improved i.e. 0.6g/kg ideal or usual body weight.

Identifying and selecting protein rich foods are difficult for liver cirrhosis patients. While on one hand, we need to give proteins which are of high biological value i.e. rich in essential amino acids; on the other hand, the intake of proteins rich in aromatic amino acids (tyrosine, tryptophan, phenylalanine etc.) should be avoided. Thus, we need to avoid animal foods and lay more emphasis on the plant origin protein foods. Thus, milk and milk products should be given in moderation; meat/fish/poultry should be avoided, whereas majority of the proteins should come from pulses and legumes/their products (besan, soy flour, soy milk, tofu etc.). Commercially available formulas which are low in aromatic amino acids, can be used in addition to the natural foods in order to ensure low intake of aromatic amino-acids.

**Carbohydrate:** The carbohydrate intake is generally recommended to remain between 60-65% of the total energy requirements. Most of the patients are able to tolerate a 300 gm carbohydrate diet. Patients suffering from severe cirrhosis (severe gastrointestinal bleeding) may initially be put on enteral or parenteral feedings (glucose, medium chain triglycerides and branched chain amino-acids). Details regarding the quality of protein to be provided remain the same as far hepatitis patients. Since the load of non-essential amino acids needs to be reduced, it is advisable to substitute the cereal exchanges with that of starch while planning diets for the patients.

**Fat:** During cirrhosis, there is elevation of fasting plasma free fatty acids, glycerol and ketone bodies. The body prefers lipids as an energy substrate. At the same time, there is marked steatorrhea. During the acute/progressive phase most patients are able to tolerate 15-20% of fat from the total energy. As the condition improves, the fat intake may be increased gradually.

However, it is the quality of fat which is of utmost importance. Emphasis should be laid on emulsified fats and some amount of long chain triglycerides should be replaced by medium chain triglycerides. Appropriately 15 ml of liquid MCT oil, 3-4 times per day is recommended (15 ml provides = 15 Kcal). Very strict fat restriction reduced the palatability of meals and should therefore be avoided. Visible fat should be used sparingly. Invisible and emulsified fat should be included in the meals such as in the form of egg, milk, cream, white butter, legumes, pulses, wheat germ etc.

**Minerals and Vitamins:** In all patients with cirrhotic ascites, dietary sodium intake may initially be restricted to 400-800 mg/day; the intake may be liberalized slightly after diuresis starts. Thus, both table salt and cooking salt should be avoided. Leaching of food is generally not advocated but it is advisable to restrict the intake of pickles, chutney, papad, ketchup, preserves, canned food, bakery products etc. (Refer to Unit 15 in the Theory Manual for sodium restricted diets). Milk/milk products, green leafy vegetables (low in sodium) and soft cooked/pureed whole pulses/legumes should be included in the diet. Fresh fruits and vegetables which are low in sodium should be incorporated in the diet.

**Fluids:** Free matter excretion gets impaired during cirrhosis and hyponatremia may develop. Restriction of fluid intake (800-1000 ml per day) is required for patients with hyponatremia (serum sodium < 125 meq/L). Patients should be counseled regarding the fluid allowance for each day and the restrictions in the intake of water and other beverages. The dietitian should preferably prepare dishes which are low in fluids/water i.e. avoids the preparation of curries and beverages. Do remember that fluid restriction is not required for all patients. It is essential only for patients developing hyponatremia.

*General Considerations*

- Oral intake may need to be supplemented/substituted with enteral/parenteral tube feedings according to the complications of cirrhosis.
- Small, frequent, easy to digest meals should be attractively served to the patient.
- Avoid high sodium foods, cooking salt/table salt, as well as, non-vegetarian foods.
- Patient should be counseled regarding the benefits of reading labels and interpret the presence of sodium as part of an additive/preservative.

A sample menu for cirrhosis patient is given herewith.

**Sample Menu – Liver Cirrhosis**

Early Morning	: Weak Tea Arrowroot biscuits
Breakfast	: Sago porridge Stewed peach and plums Potato roll
Mid Morning	: Sweet Vermicilli Rice Kanji
Lunch	: Washed Masoor dal Carrot potato sabzi Rice Curd
Evening Tea	: Paneer tomato onion sandwich Weak tea
Dinner	: Arhar dal Seasonal Vegetable Preparation Rice Jaggery coated sweet potato
Post Dinner	: Baked custard with fruit jelly

With this, we end our study about the liver diseases. The digestion of food requires a coordinated functioning of both the liver, as well as, the gall bladder. Diseases of the liver may be found in association with that of the gall bladder; both or any one of them can have serious nutritional implications. We shall now proceed towards the understanding of the major disorders associated with disturbed functioning/ altered physiology of the gall bladder.

## **7.4 DISEASES OF THE GALL BLADDER**

As we all know, our gall bladder is a pear shaped organ which is connected to the liver and the duodenum. Refer to Unit 6, Figure 6.13, in the Applied Physiology Course (MFN-001) to review the structure of the gall bladder. The gall bladder stores about 50 ml of bile, which is released when food containing fat enters the digestive tract, stimulating the secretion of cholecystinin.

You must have read about the etiological factors for the gall bladder diseases in the Unit 15 of the Theory Manual (MFN-005). In this practical, we shall discuss about the dietary management of:

- cholecystitis (inflammation of the gall bladder)
- cholelithiasis (gall stones).

The major symptoms which may alter food intake and hence affect the nutritional status of the patient include:

- abdominal fullness (flatulence)
- severe and recurrent right upper quadrant or epigastric pain. It is more severe after eating or drinking fatty foods or fluids and on taking deep breaths.
- fever
- nausea, vomiting and heartburn
- chills and shaking
- chest pain under the breast bone

The treatment of cholelithiasis include:

- Laparoscopic or conventional open cholecystectomy.
- Lithotripsy in combination with bile salt therapy
- Dietary management

The treatment of cholecystitis include:

- Dietary modifications
- Drugs to alleviate pain (meperidine)
- Ultra-sound guided aspiration of the gall bladder or percutaneous cholecystostomy.

Here in this practical we will focus on the dietary modifications necessary for the successful management of cholelithiasis and/or cholecystitis.

#### **7.4.1 Principles of Dietary Management – Cholelithiasis/Cholecystitis**

Diseases of the gall bladder such as cholelithiasis (gall stones) and cholecystitis (inflammation of the gall bladder) generally occur in association with each other. An inflamed mucosa of the gall bladder may affect its reabsorptive capacity and alter the composition of bile juice resulting in precipitation of its component(s) and hence the development of gall stones. However, at times the physical presence of stones over a prolonged period may cause inflammation/injury to the mucosa of the gall bladder.

Changing dietary habits and life-style practices are resulting in an increased incidence of cholelithiasis/cystitis. A high cholesterol intake, lack of dietary fibre, deficiency of PUFAs and irregular meal timings are predisposable factors associated with cholelithiasis/cystitis. While cholelithiasis is generally asymptomatic and chronic in nature, it may be found in association with acute attacks of cholecystitis. Both the diseases may necessitate altered nutrient intake by the patient. We shall first briefly discuss about the dietary management of an acute attack of gall bladder diseases and then proceed towards nutritional modifications during cholelithiasis.

##### *Acute Phase – Cholecystitis and/or Cholelithiasis*

An acute attack is characterized by sudden onset of piercing sustained upper quadrant pain in the abdomen after the consumption of a meal containing fat. The major objective(s) of patient management is:

- to keep the gall bladder inactive,
- to provide the relief from pain,
- to treat the underlying cause, and
- to provide nutritional support during the phase of remission.

It is generally a state of emergency demanding complete withdrawal of oral intake of food and fluids for atleast the first 12 to 24 hrs. The patient is given antibiotic(s) and

analgesic(s) along with parenteral or enteral tube feedings. Enteral foods which are low in fat or contain elemental fat should be used till it is confirmed that a surgery is to be done. In case surgery is not required or can be postponed, a low fat diet may be initiated.

*Chronic Phase - Cholelithiasis*

The presence of gall stones in the gall bladder may remain asymptomatic even after their diagnosis. Dietary management of cholelithiasis patient should be carried out with the following objectives in mind:

- to prevent further progression of cholelithiasis,
- to promote and maintain an optimum nutritional status, and
- to help in alleviating the underlying cause (hypercholesterolemia, excess body weight), if feasible.

Our subsequent discussions will help us in understanding what dietary modifications can facilitate in meeting the above mentioned objectives. We shall first discuss the nutrient modifications and then proceed towards dietary habits. Let us first begin with energy.

*Energy:* Ambulatory patients having a healthy body weight need not modify their calorie intake. However, higher incidence has been found among overweight/obese individuals, those on a very-low calorie diet or these who consume meals after a prolonged gap. Thus, the energy intake of the patient should be calculated on the basis of his ideal body weight and usual/present body weight. The procedure for calculating the energy requirements on the basis of IBW has been discussed in Practical 4 (Diet during Weight Management) earlier. Follow the procedure mentioned in this practical.

*Fat:* A low fat diet is generally recommended. Total dietary fat should provide 20% of the total energy in the diet. More drastic restriction is not suggested. Emphasis should be laid on the inclusion of emulsified fats and those rich in medium chain triglycerides (coconut oil, olive oil). Thus, skim milk/skim milk products (cottage cheese, curd, yoghurt etc.), lean meat (poultry, marine food), egg whites, most legumes, vegetables and fruits (except avocado) should be preferred. Ample amounts of vegetables and sprouts should be included in the diet but in a cooked/easy to digest form, especially if the person is overweight/obese. Dietary cholesterol restrictions are not very useful for the prevention of cholelithiasis. However, during the course of treatment, it is recommended to keep the dietary intake as low as 10-100 mg/day. Thus, animal products should be consumed in very limited amounts. Refer to Table 7.1 which presents the daily food allowances to provide 40 g fat in the diet.

**Table 7.1: Daily food allowance (40 g fat diet)**

Food	Amount
Toned Milk	2 cups
Lean meat fish, poultry	30 g
Pulses/legumes	2-3 serving
Egg whites	three-four per week
Vegetables	> 3 servings (> 1 dark green leafy veg.)
Fruits	3 servings (atleast 1 citrus)
Cereals	as per recommendation
Fat	< 4 exchanges
Desserts/sweets	Optional/ to be avoided.

**Protein** : The protein intake should remain the same as for healthy individuals i.e. 1.0 gm/kg ideal body weight per day. However, in case of Cholecystitis slight increase in protein may be recommended i.e. 1.1-1.2 g/kg ideal body weight. A combination of plant and animal proteins should be provided to maintain a good nutritional status of the patient (especially important pre- and post-operatively). Lean meats, egg whites, skim milk, skim milk products (yoghurt, curd, paneer), well cooked whole pulses/legumes/sprouts, pulses without husk, soya flour, Bengal gram flour, soya milk, tofu etc. can be given to the patient in moderate amounts.

**Carbohydrates** : Nearly 60% of the total energy should come from carbohydrates. The frequency of gall bladder diseases has been found to be higher among populations consuming a low fibre diet thereby indicating a protective role of fibre. Certain components of fibre modify the composition of bile acid pool and also increase the amount of chenodeoxycholic acid which enhances the solubility of biliary cholesterol. However, high fibre foods may at the same time aggravate the problem of abdominal flatulence. Thus, all high fibre foods should be included in a well cooked form. The patient should avoid consuming raw vegetables and whole pulses, should preferably be soaked overnight before cooking. Similarly, sprouts may be sautéed/steamed rather than consuming them raw.

**Vitamins and Minerals**: An increase or decrease in the requirement of vitamins and minerals has not been reported. However, if the patient remains on a fat restricted diet for a long-time; fat-soluble vitamins need to be included in the diet. Thus,  $\beta$ -carotene rich foods (green leafy vegetables, orange and yellow coloured fruits/vegetables) should be included in the diet. Vitamin K supplements may be required during an acute attack due to itching, jaundice and bleeding problems.

**Fluids** : Plenty of fluids need to be given, particularly during the acute phase. This is particularly important if the patient is suffering from vomiting. In such cases, around 2-3 litres of fluids should be consumed in 24 hrs to prevent dehydration. If vomiting is severe/persistent; the patient should be given clear fluids at hourly intervals. This may be followed by a full-fluid diet till the absorption improves. Therefore, give plenty of clear fluids such as coconut water, rice/carrot kanji, clear soups, clear broths, jelly, sugar candies, glucose water, lemon/barley/saunf water etc. These may be followed by full fluids such as milk shakes, tea, coffee, soufflé, fruit juice, vegetable/pulse soup, custard etc.

#### *Special Considerations*

- Large and high fat meals should be completely avoided.
- Small, frequent low fat meals should be consumed and a fixed meal pattern should be adopted.
- Certain foods such as cauliflower, cabbage, rajmah etc. are potential gas formers which should be avoided if the patient is experiencing abdominal fullness.
- Well cooked, easy to digest meals should be given. Moist heat methods of cooking such as pressure cooking, steaming, boiling, stewing, broiling should be preferred.
- The fat allowance should be distributed evenly throughout the day to facilitate drainage of bile from the gall bladder.
- Patient must be counseled to prevent starvation/fasts as it increases the risk for precipitation of bile components in the gall bladder.
- Very low calorie/fat diets and starvation therapies should be completely avoided by such patients.

A sample menu for a low fat diet is presented next for your reference.

7.00 a.m.	:	Weak tea or 1 cup skim milk
9.00 a.m.	:	Egg Nog, pureed sago in vegetable juice
11.00 a.m.	:	Fruit juice (pineapple)
1.00 p.m.	:	Cream of potato soup, Rice kanji Soft custard
3.30 p.m.	:	Mango yoghurt
5.30 p.m.	:	Banana shake
7.30 p.m.	:	Semolina pudding
9.00 p.m.	:	Pulse and veg puree Soufflé with gelatin dessert
11.30 p.m.	:	Milk or fruit ice-cream with jelly

We shall now brief ourselves with the pathophysiology related to the diseases of the pancreas.

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## 7.5 DISEASES OF THE PANCREAS

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Pancreas is an organ located posterior to the stomach and in close association with the duodenum. Refer to Figure 6.11 in Unit 6 in the Applied Physiology Course (MFN-001) to refresh your knowledge about the pancreas pathophysiology. The pancreas, you may recall studying, produces enzymes that break down all categories of digestible foods (exercise) and secretes hormones that affect carbohydrate function (endocrine).

The most common diseases of the pancreas are:

- Benign tumors
- Carcinoma of pancreas
- Cystic fibrosis
- Diabetes Mellitus
- Pancreatic insufficiency
- Pancreatitis (acute/chronic)

In this section we will discuss the acute and chronic pancreatitis in detail. The major focus shall be on the dietary management of these conditions. Diabetes disorder associated with the endocrine function of pancreas has already been discussed in Practical 4 earlier.

### 7.5.1 Principles of Dietary Management – Pancreatitis

Acute pancreatitis, you may recall studying, is rapid inflammation of the pancreas which results from ‘escape’ of pancreatic enzymes from acinar cells into the surrounding tissues.

Chronic pancreatitis generally occurs as recurrent episodes of acute inflammation in previously injured pancreas or as chronic damage with persistent pain or malabsorption.



Patients with pancreatic disease are particularly likely to have nutrition-related problems and be nutritionally depleted. Undernutrition is a high risk as a result of poor dietary intake (due to anorexia and/or alcohol/drug abuse), malabsorption (pancreatic exocrine insufficiency), hypercatabolic effects and the need for food withdrawal during acute phases of the disease. As discussed earlier, both acute and chronic pancreatitis can markedly affect the nutritional status of the patient. Nutritional support therefore plays an important role in the prognosis of the disease. We will first brief ourselves regarding the nutritional support required during acute pancreatitis.

#### *Nutrition Support during Acute Pancreatitis*

In view of the fact that acute pancreatitis is generally accompanied by duodenal ileus and prolonged gastrointestinal dysfunction, as well as, pain which is associated with the release of pancreatic enzymes and bile; it is advisable to withhold oral and enteral feeding atleast for the first few days i.e. provide 'rest' to the pancreas. The nutritional support regime generally followed includes:

- Adopt "NPO", no oral /enteral feeding on admission.
- Maintaining fluid and electrolyte balance by intravenous feeding.
- If condition is expected to improve within a week; include enteral nutrition in the dietary regime.
- For more severe cases adopt parenteral nutrition. Parenteral formulas may contain dextrose or dextrose with lipid emulsions if serum triglycerides < 400 mg/dl).
- A clear liquid diet (6-8 feeds per day) with negligible fat should then be initiated and the patient should be monitored carefully.
- Aggressive nutrition support may involve attempts to use the gastrointestinal tract. Polymeric formulas stimulate the pancreas more than elemental/ hydrolyzed formulas. Thus, enteral nutrition (elemental/gastric phases of exocrine pancreatic stimulation are eliminated) as per the tolerance level of the patient.

A sample menu for acute pancreatitis is given herewith for your reference.

#### **Sample Menu:Clear Liquid Diet**

7.00 a.m.	:	Strained apple juice with honey
9.00 a.m.	:	Lemonade and fruit ice
11.00 a.m.	:	Tea without milk
1.00 p.m.	:	Meat broth, ginger water
3.30 p.m.	:	Consomme' (vegetable)
5.30 p.m.	:	Orange gelatin, coconut water
7.30 p.m.	:	Strained pineapple juice
9.00 p.m.	:	Chicken broth, barley water, strained moong dal water
11.30 p.m.	:	Grape fruit jelly

Let us now discuss the principles of dietary management during chronic pancreatitis/remission phase after successful management of acute pancreatitis.

#### *Nutrition Support during Chronic Pancreatitis*

Maintenance of an adequate nutritional status is the most crucial objective to be met in view of the recurrent attacks of epigastric pain associated with meals and presence of nausea, vomiting and/or diarrhoea. Patient usually present symptoms and signs of

malnutrition such as gradual weight loss, deficits of lean muscle/adipose tissue, visceral protein depletion and impaired immune function. Thus the major objective of nutritional care is to:

- prevent further damage to pancreas,
- reduce episodes of pain associated with meals,
- correct malnutrition, and
- maintain a positive energy and protein balance (if feasible), and
- decrease steatorrhoea and other gastrointestinal disturbances.

Thus, the following dietary modifications may be necessary to improve the overall health status of the patient. We will begin our discussions with energy and then proceed to macro- and micro-nutrient intake.

*Energy:* Most of the patients are severely emaciated and in a compromised state of health. Persistent indigestion and an increase in resting energy expenditure are the major reasons of weight loss. Ideally, the patient should be given liberal calories to promote weight gain i.e. ~35 Kcal/kg IBW/day which is practically not possible during the clear liquid or liquid diet. The patient maybe required to be fed easy to digest (soft, semi-soft or blenderized meals) food so as to help in minimizing gastric discomfort.

*Protein:* High amount of protein i.e. 1.0 - 1.2g/kg body weight/ day should be provided to prevent further nutritional depletion. Enzyme supplementation therapy may be required to facilitate proper digestion of proteins. Emphasis must be laid on easy to digest high biological value proteins. However, we should choose those foods which are at the same time low in their fat content. Thus, red meats, egg yolk, whole milk and whole milk products should be avoided. Egg white, lean meats, skimmed milk/ skimmed milk products, pulses, legumes, soya milk, tofu should be preferred. Isolated intact/ hydrolyzed proteins/ protein supplements like whey protein, soy protein, casein, etc. may be used depending upon the tolerance level of the patient.

*Fat:* The fat intake should be minimized to as low as feasible. Initially it can be progressed from no fat to low fat soft- diet. The amount of fat incorporated in the diet depends upon the severity of steatorrhoea, enzyme replacement therapy and the degree of malnutrition. The average fat intake should be kept below 15-20% of the total energy. Further, majority of the visible fat should be in the form of medium chain triglycerides (MCTs). Natural MCTs are found in milk fat, coconut oil and palm kernel oil. Low fat foods should be preferred such as fish, chicken, egg white, low fat milk, low fat milk products (curd, yoghurt, cheese) etc. Fried foods, high fat foods such as bakery products or dishes prepared by sautéing in liberal amounts of fat, cream, butter, margarine, bread spreads with fat base, and cooking oils should be completely restricted. Boiling, low-fat baking, steaming, micro-wave cooking and the use of non-stick cook-ware are helpful in reducing the fat content of meals. Commercial MCT oils can easily be incorporated in the meals after cooking especially in soups, cereal, desserts, vegetable/pulse preparations.

*Carbohydrates:* Liberal amounts of carbohydrates (>60% of the total energy) should be provided in the diet to promote weight gain and spare proteins and fat for necessary metabolic functions. Low fibre, easy to digest carbohydrates should be provided in the diet. Foods rich in mono/disaccharides and starches should be incorporated in the diet such as sugar, honey, dextrose, sugarcane juice, date, sugar candies, starchy roots/tubers (potato, yam, colocasia), arrowroot, sago, rice, refined four, pastas, semolina, white bread, chirwa (flattened rice), murmura (puffed rice) etc. The intake of dietary fibre should be minimized in view of gastrointestinal disturbances. Thus, fruits such as mango, banana, grapes, and dates should be preferred over guava, pear, pineapple etc.

*Vitamins and Minerals:* Steatorrhoea may result in impaired absorption of fat-soluble vitamins, as well as, deficiency of calcium and iron. Vitamin B<sub>12</sub> deficiency may also

arise due to the deficiency of pancreatic protease. Appropriate pancreatic enzyme supplementation therapy can help in alleviating steatorrhoea and facilitating proper digestion and absorption of food/nutrients. A balanced diet containing a variety of easy to digest foods can help in alleviating steatorrhoea and facilitating proper digestion and absorption of food/nutrients.

*Fluids:* Dehydration may develop during the acute phases of chronic pancreatitis or when steatorrhoea may get aggravated due to high intake of fat. The fluid intake should be increased by including clear-fluids/full-fluids such as rice kanji, vegetable stock/soup, fruit juices, pulse/legume water, egg nog, coconut water, barley water, soufflé, jelly, syrups etc.

*Special Considerations*

- Small, frequent, low fat easy-to-digest feeds/meals should be given to the patient.
- If steatorrhoea is severely aggravated (before/during the initiation of enzyme replacement therapy), the diet would need to be modified in consistency. The patient may initially be given full-fluid diet followed by a semi-soft and then a soft diet.
- In view of the impaired gastrointestinal capacity, it is essential to provide well-cooked meals to the patient. If the need be, blenderized meals may be given (purees, khichdi etc.)
- Fat used for cooking food should be kept to a minimum. Thus, steaming, boiling, pressure cooking should be preferred. Frying, high fat stewing should be avoided. Roasted and grilled foods need to be avoided as they are difficult to digest.

Now, we end our study on the dietary management of pancreatitis. Based on this knowledge, let us now plan diets for the different disease conditions discussed in this practical. There are three activities included in this practical. These activities will help you practice what you have learnt so far. Before you begin with the activities, try attempting the questions included in the review exercises given next. This will help you consolidate your understanding of the crucial aspects discussed in this practical so far.

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## 7.6 REVIEW EXERCISES

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- 1) Discuss Jaundice with relevance to hepatitis.  
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- 2) Which type of cooking methods should be preferred while preparing meals for individuals suffering from hepatitis. Give reason(s).  
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.....
- 3) Why should we restrict sodium intake of a liver cirrhosis patient? Enlist the foods to be restricted/avoided and those which can be taken liberally in a moderate sodium restricted diet.  
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.....  
.....

4) Plan two breakfast menu's for liver cirrhosis patients.

**Menu 1**

**Menu 2**

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5) Compute the modified nutritional requirements of Kamsa, a 39 years old women suffering from cirrhosis due to acute recurrent attacks of infective hepatitis. She has mild portal hypertension and ascites.

**Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Fat (g)		
Sodium (mg)		

6) What is the benefit of consuming medium chain triglycerides during cholelithiasis?

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7) Differentiate between acute and chronic pancreatitis.

**Acute Pancreatitis**

**Chronic Pancreatitis**

- 1)
- 2)
- 3)
- 4)
- 5)

8) Chronic pancreatitis is associated with depleted reserves of several micronutrients. Identify any four such micronutrients and enlist their dietary management.

- 1) .....
- 2) .....
- 3) .....
- 4) .....

9) How can we reduce the fat content of the following meal menu's?

**Menu 1 (Lunch)**

- Chicken curry
- Spinach kofta in tomato sauce
- vegetable pulao
- Boondi raita
- chappati

**Menu 2 (Evening Tea)**

- Butter Biscuit
- Coffee

10) Enlist a few counseling tips for Radha regarding low-fat food choices. She is suffering from chronic pancreatitis and anaemia.

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Now carry out the activities included in this practical.



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## ACTIVITY

# 1

## DIET PLAN FOR HEPATITIS

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Date :

**Aim** : To plan a diet for a patient suffering from hepatitis.

**Case Study** : Ritesh is a 12 year old boy studying in a public school who is fond of eating street foods. For the past ten days he has been experiencing anorexia, nausea, vomiting and malaise. At present he is having a mild fever ( $< 38^{\circ}\text{C}$  average), enlarged tender liver and jaundice. His biochemical reports have indicated a low white cell count and markedly elevated aminotransferases. Liver biopsy has indicated mild hepatocellular necrosis. Blood culture is indicative of hepatitis A virus. Ritesh has been advised to take complete bed rest. He has been prescribed a high energy, high protein, soft, bland diet. Adequate precautions such as thorough washing of hands (especially after bowel movements) and careful cleaning of patient's belongings have been advocated.

Based on this case study now plan a diet for Ritesh following the instructions given herewith.

### Introduction

(In the space provided herewith, describe the disease which Ritesh is suffering from. Elaborate on why has he been advised to consume a high energy high protein diet).

### Step I: Patient's Profile

On the basis of the details mentioned in the case; fill in the case profile in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

In view of the case details and the principles of dietary management discussed earlier in this practical, carefully identify and prioritize the major objectives of nutrient modifications so as to help in preventing reoccurrence/development of complications, as well as, promoting quick recovery for Ritesh.

#### *Objectives of dietary management*

### Step II: Assess the nutritional requirements of Ritesh

Write the RDI for Ritesh in the format given herewith. Also write the calculations in the space provided.

#### **Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Vitamin A ( $\mu$ g)		

#### *Calculations:*

**Step III: Now carefully select the food exchanges that can help in providing the nutrients as per the modified RDI.**

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrates (g)	Fats (g)
Whole Milk					
Skim Milk					
Meat					
Pulse					
Cereals					
Roots/ Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Fat					
Sugar					

(Note: Avoid giving too many exchanges of fat because the digestion of fat get impaired during hepatitis).

**Step IV: Select an appropriate meal pattern for Ritesh**

Remember, anorexia, nausea, vomiting, and other symptoms associated with jaundice reduce the food intake and result in malnutrition. Small, frequent, nutrient dense meals prove to be beneficial. Decide on the meal pattern and distribute the exchanges within the meal pattern in the format given herewith. (Note: You may modify the meal timing/frequency given in the format below).

Exchange	No.	Early Morning	Light Breakfast	Mid Morning	Early Lunch	Evening Tea		Dinner	Post Dinner
						Early	Late		
Whole Milk									
Skim Milk									
Meat									
Pulse									
Cereals									
Roots/ Tubers									
Other Vegetables									
Leafy Vegetables									
Fruit									
Fat									
Sugar									

**Step V: Next, we need to plan a day's menu for Ritesh by keeping in mind his clinical condition and nutritional needs.**

Identify dishes in accordance with the age of the patient. You may follow the 7 meal pattern (Early Morning, Light Breakfast.....Post Dinner etc.) given in Step IV above or modify the meal frequency and timings as per your understanding. Write the days menu in the space provided herewith.



**Sample Menu for a Day**

<b>Early Morning</b>	<b>Breakfast</b>	<b>Mid-Morning</b>	<b>Lunch</b>	<b>Evening Tea (Early/Late)</b>	<b>Dinner</b>	<b>Post Dinner</b>

**Step VI : Detailed menu plan**

(Give the detailed menu planning in the format given herewith).

<b>Meal</b>	<b>Menu</b>	<b>Ingredients</b>	<b>Amt (g)</b>	<b>Exchange</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Carbo-hydrates (g)</b>	<b>Vitamin A (µg)</b>



## DIET PLAN FOR LIVER CIRRHOSIS

**Aim** : To plan a diet for a patient suffering from liver cirrhosis.

Date :

**Case Study** : Mr. Patra is a 49 years old business man who was admitted to the hospital complaining of abdominal pain, oedema in the lower limbs, severe nausea and vomiting. Imaging tests such as ultrasound etc. have confirmed the diagnosis of varices veins, ascites and an enlarged liver with orange coloured nodules. He is presently excreting tea-coloured urine and clay-coloured stools. His biochemical parameters are as follows:

Blood Ammonia	:	63 µg/dl
Alkaline Phosphatase	:	133 units /L (++++)
Serum bilirubin	:	47 mg/Litre
Serum albumin	:	1.9 g/dl
Haemoglobin	:	7.5 g/dl
Folic acid (red cells)	:	103 µg/ml
Prothrombin Time	:	>23 seconds
Systolic Blood Pressure	:	165 mmHg
Diastolic Blood Pressure	:	104 mmHg

Over the past four months, he has been complaining of profound weakness and has been gradually losing weight. Mr. Patra was a chronic alcoholic for about 15 years and has left consuming hard drinks for the past 2 years. He has been an old case of chronic alcoholic hepatitis with parenchymal necrosis.

At present his diagnosis is indicative of liver cirrhosis. He has been advised to take bed rest and consume a high energy, protein and sodium restricted, soft, bland diet. He will be kept under close medical observation/treatment to prevent the development of hepatic encephalopathy.

Based on this case study now plan a diet for Mr. Patra following the instructions given herewith.

### Introduction

(Identify and describe the clinical condition of Mr. Patra in the space provided herewith).

Comment on the significance of the following parameters with reference to the nutritional/health status of the patient.

- a) Serum bilirubin
- b) Blood Ammonia
- c) Serum albumin
- d) Prothrombin time

**Step I: Patients Profile**

On the basis of the clinical condition discussed in the case, fill the patient details in the format given below.

		<i>Patient/Case Profile</i>	
Name:			
Age:			
Gender:			
Activity:			
Dietary habits:			
Socio-economic status:			
Pathophysiological stress:			
Diet prescribed:			
	<b><i>Clinical Profile</i></b>	<i>Patient Value</i>	<i>Normal Value</i>
	Blood Ammonia		
	Alkaline Phosphatase		
	Serum bilirubin		
	Serum albumin		
	Haemoglobin		
	Folic acid (red cells)		
	Prothrombin Time		
	Systolic Blood Pressure		
	Diastolic Blood Pressure		

Keeping in mind the clinical symptoms of Mr. Patra, identify and prioritize the various objectives of dietary modifications. List them in the space provided herewith.

***Objectives of dietary management***

**Step II: Assess/calculate the nutritional requirements of Mr. Patra**

Write in the format given herewith. Compare Mr. Patra's RDI with the RDI for a healthy sedentary adult man.

**Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Calcium (mg)		
Iron (mg)		
Vitamin A (µg)		
Sodium (mg)		

**Calculations:**

**Step III: Now based on the modified RDI, carefully select the food exchanges that can help in providing relief to Mr. Patra, in the format given herewith.**

<b>Exchange</b>	<b>No.</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Carbohydrates (g)</b>	<b>Fats (g)</b>
Whole Milk					
Skim Milk					
Meat					
Pulse					
Cereals					
Roots/ Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Fat					
Sugar					

**Step IV: Distribute the food exchange for each meal**

Mr. Patra is suffering from abdominal pain, severe nausea and vomiting. Select an appropriate meal pattern which can help in facilitating an adequate food intake. Distribute the food exchanges accordingly.

Exchange	No.	Early Morning	Light Breakfast	Mid Morning	Early Lunch	Evening Tea		Dinner	Post Dinner
						Early	Late		
Whole Milk									
Skim Milk									
Meat									
Pulse									
Cereals									
Roots/tubers									
Other Vegetables									
Leafy Vegetables									
Fruit									
Fat									
Sugar									

**Step V: Plan a day's menu for Mr. Patra**

Do remember his clinical condition (enlarge liver, ascites, varices veins) and plan a menu for him which is nutrient dense, easy to digest and bland. (You may modify the meal frequency/timings).

**Sample Menu for Mr. Patra**

Early Morning	Breakfast	Mid-Morning	Lunch	Evening Tea	Dinner	Post Dinner

**Step VI : Detailed menu plan**

(Give the detailed menu plan in the format given herewith).

<b>Meal</b>	<b>Menu</b>	<b>Ingredients</b>	<b>Amt(g)</b>	<b>Exchange</b>	<b>Protein (g)</b>	<b>Carbo- hydrates (g)</b>	<b>Vitamin A (µg)</b>
<b>Grand Total</b>							

**Conclusion**

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

<b>Nutrient</b>	<b>Modified RDI</b>	<b>Detailed Diet Plan</b>	<b>± % of Difference</b>	<b>Suggestions for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
Carbohydrate (g)				
Vitamin A (µg)				

*What counseling tips would you give to Mr. Patra/his care-givers regarding the food choices/intake (give special emphasis to sodium intake)?*

**Submit the activity for evaluation.**

---

**Counselor's Signature**



## DIET PLAN FOR CHOLELITHIASIS/ CHOLECYSTITIS

**Aim** : To plan a diet for a patient suffering from cholelithiasis.

Date :

**Case Study** : Mala, a 57 years old women (height 5'3"; weight 64 years) was admitted to the gastroenterology ward of a hospital when she complained of sudden onset of severe steady epigastric pain, nausea and recurrent vomiting. She had been diagnosed to be having small stones in her gall bladder about a year ago. Imaging tests on admission have indicated inflammation of the gall bladder, along with cholelithiasis. Some of the biochemical tests conducted was:

White blood cells: 14,500  $\mu$ l

Serum bilirubin: 3.9 mg/dl

Serum aminotransferase: 300 units/ml

She was given drugs to relieve pain and was kept on an NPO regime for 12 hrs. Thereafter, she was given enteral tube feed for about 24 hours. At present she has been advised to adhere to a low fat weight reduction diet and her condition shall be monitored for one month. Mala is being counseled for conducting laproscopic cholecystectomy (if required).

Based on this case study, now plan a diet for Mala following the instructions given herewith.

### Introduction

(Elaborate on what is cholelithiasis and discuss the association between cholelithiasis and cholecystitis in the space provided herewith).

Comment how can an NPO regime and low-fat enteral tube feeds be helpful during the recessive phase of an acute attack during cholecystitis?

### Step I: Patient Profile

Identify the case details and mention them in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

#### *Clinical Profile*

*Patient Value*

*Normal Value*

White Blood Cells

Serum bilirubin

Serum amino transferase

Ideal Body Weight

Body Mass Index

Mala is suffering from both cholelithiasis, as well as, its associated cholecystitis. Based upon the principles of dietary management discussed in section 7.4 and the case details identified above, prioritize the objectives of dietary management for her in the space provided herewith.

#### *Objectives*

### Step II: Assess and compute the nutritional requirements of Mala

Remember that the patient is overweight/obese and is suffering from cholelithiasis. Oral intake is generally resumed when the inflammation has subsided. Accordingly calculate the nutrient requirements and compare them with the requirements of normal individual.

#### **Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Fat (g)		
Crude Fibre (g)		
Cholesterol (mg)		
Calcium (mg)		

**Calculations:**

**Step III:** Next select the food exchanges that can help in providing the nutrients as per the nutritional needs (modified RDI) of the patient given above.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrates (g)	Fats (g)
Skim Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Fat					
Sugar					

(**Note:** Fat should be given in limited amounts because of its association with contraction of the gall bladder.)

**Step IV: Select an appropriate meal pattern for Mala**

Due to impaired functioning of the gall bladder and abdominal pain/flatulence, small frequent meals are recommended for patients suffering from diseases of the gall bladder. Therefore, select an appropriate meal pattern for Mala and distribute all the food exchanges proportionately throughout the day in the format given herewith.

Exchange	No.	Early Morning	Light Breakfast	Mid Morning	Early Lunch	Evening Tea		Dinner	Post Dinner
						Early	Late		
Skim Milk									
Meat									
Pulse									
Cereals									
Roots/Tubers									
Other Vegetables									
Leafy Vegetables									
Fruit									
Fat									
Sugar									

**Step V: Select appropriate dishes to plan a day's menu for Mala**

Remember, the meals should be low in calories, easy to digest, bland and at the same time provide satiety to promote recovery, prevent progression of the disease and at the same time facilitate weight reduction. (You may modify meal frequency/timings).

**Sample Menu for Mala**

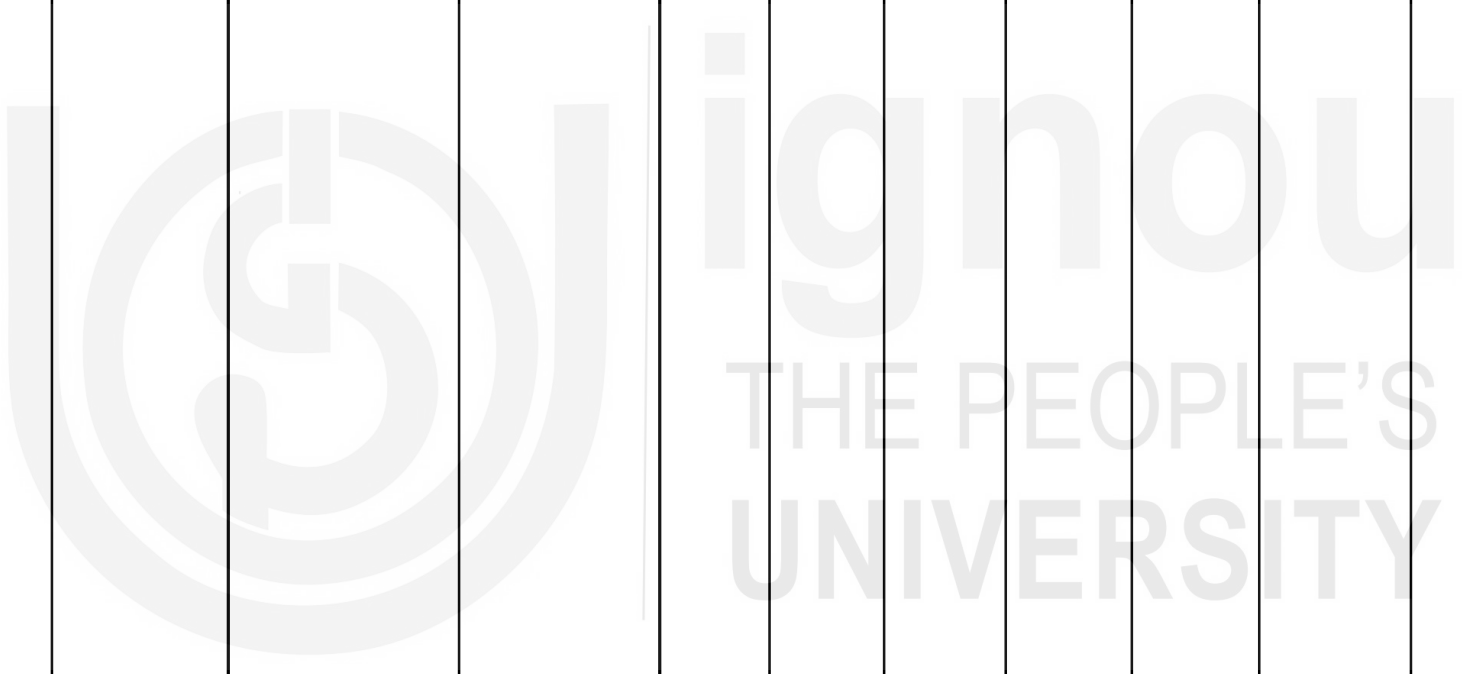
Early Morning	Breakfast	Mid Morning	Lunch	Evening Tea		Dinner	Post Dinner
				Early	Late		

**Step VI: Detailed menu plan**

(Write the detailed menu plan in the format given herewith).

Meal	Menu	Ingredients	Amt (g)	Exchange	Energy	Protein (g)	Carbohydrates (g)	Vitamin A (µg)

Meal	Menu	Ingredients	Amt (g)	Exch- ange	Energy	Protein (g)	Carbo- hydrates (g)	Vitamin A (µg)
<b>Total</b>								



### Conclusion

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

Nutrient	Computed Modified RDI	Detailed Diet Plan	$\pm$ % of Difference	Suggestions for Improved Intake
Energy (Kcal)				
Protein (g)				
Crude Fibre (g)				
Dietary Fibre (g)				
Iron (mg)				
Vitamin A ( $\mu$ g)				

*Comment on what is the significance of calculating dietary fat/cholesterol and crude fibre content of the detailed menu plan.*

**Submit the activity for evaluation.**

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**Counselor's Signature**

**ACTIVITY****4****DIET PLAN FOR PANCREATITIS**

---

Date :

**Aim** : To plan a diet for a patient suffering from pancreatitis.**Case Study** : Mr. Ramesh is a 39 years old (height 5'5", weight 61 kg) accountant working in middle cadre export house. He was admitted to the hospital during an acute phase of chronic pancreatitis. He was complaining of persistent/recurrent episodes of epigastric and left upper quadrant pain radiating towards the upper left lumbar region. He has been experiencing anorexia, nausea, vomiting and steatorrhea for more than 6 months. Laboratory findings have indicated elevated levels of serum amylase, lipase and alkaline phosphatase. He has been advised to completely restrict alcohol intake. At present he is on a full fluid diet for 24 hours and thereafter he has been prescribed a high energy, low fat, soft diet. Mr Ramesh has been put on pancreatic enzyme supplementation therapy in view of steatorrhea, gastric discomfort and weight loss due to malabsorption.

Based on the case study, plan a diet for Mr. Ramesh following the instructions given herewith.

**Introduction**

(In the space provided herewith, describe the term 'chronic pancreatitis'. Comment, why Mr. Ramesh has been prescribed a full-fluid diet before the initiation of high energy-low fat soft diet).

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**Step I: Patient's Profile**

Read the case carefully, and mention the patient details in the format given below:

***Patient/Case Profile***

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed a).....

b).....

Body Weight Present.....kg

Ideal Body Weight.....kg

Keeping in mind the clinical and laboratory findings of Mr. Ramesh, identify and prioritize the objectives of dietary modification here in the space provided.

*Objectives*

**Step II: In view of the present health status of Mr. Ramesh, assess/calculate his nutritional requirements that would enhance recovery and promote weight gain/nutritional status.**

**Recommended Dietary Intake**

<b>Nutrient</b>	<b>Normal</b>	<b>Modified</b>
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Fat (g)		
Fibre (g)		
Calcium (mg)		
Vitamin A (µg)		

***Calculations:***



**Step III: Now select the food exchanges that would be most appropriate for providing the nutrients as per the needs of Mr. Ramesh.**

Do remember the restrictions required for fat intake with respect to steatorrhoea.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrates (g)	Fats (g)
Whole Milk					
Skim Milk					
Meat					
Pulse					
Cereals					
Roots/Tubers					
Other Vegetables					
Green Leafy Vegetables					
Fruit					
Fat (limit)					
Sugar					

**Step IV: Distribute the selected exchanges according to the meal pattern most suitable during chronic pancreatitis.**

Select a meal pattern for Mr. Ramesh that can help in alleviating / reducing symptoms associated with steatorrhoea and which can promote weight gain (You may add or modify the meal pattern mentioned in the format given herewith).

Exchange	No.	Early Morning	Light Breakfast	Mid Morning	Early Lunch	Evening Tea		Dinner	Post Dinner
						Early	Late		
Skim Milk									
Whole Milk									
Meat									
Pulse									
Cereals									
Roots/Tubers									
Other Vegetables									
Green Leafy Vegetables									
Fruit									
Fat									
Sugar									

**Step V: Plan a day's menu for Mr. Ramesh**

By using the exchanges (given in step IV above) available for each meal. Lay emphasis on low fat, moderate protein, high energy soft and easy to digest meals. You may refer to sub-section 7.5.1 earlier for completing this exercise.

**Sample Menu for Mr. Ramesh**

Early Morning	Breakfast	Mid Morning	Lunch	Evening Tea		Dinner	Post Dinner
				Early	Late		

**Step VI :Detailed menu plan**

(Give the detailed menu plan in the format given herewith).

Meal	Menu	Ingredients	Amt (g)	Exchange	Energy (Kcal)	Protein (g)	Fat (g) Visible/ Invisible	Calcium (mg)

Meal	Menu	Ingred- -ients	Amt (g)	Exchange	Energy (Kcal)	Protein (g)	Fat (g) Visible/ Invisible	Calcium (mg)
<b>Total</b>								



**Conclusion**

Compare the grand total obtained for various nutrients in the detailed menu plan with the computed modified RDI and interpret as follows:

<b>Nutrient</b>	<b>Computed Modified RDI</b>	<b>Detailed Diet Plan</b>	<b>± % of difference</b>	<b>Suggestions for Improved Intake</b>
Energy (Kcal)				
Protein (g)				
Fat (g)				
Calcium (mg)				

**Submit the activity for evaluation.**

---

**Counselor's Signature**

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# PRACTICAL 8 PLANNING DIETS FOR RENAL DISEASES

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## Structure

- 8.1 Introduction
- 8.2 Renal Diseases – An Overview
  - 8.2.1 Glomerulonephritis/ Acute Glomerular nephritis
  - 8.2.2 Nephrotic Syndrome
  - 8.2.3 Chronic Renal Failure (CRF)
  - 8.2.4 Acute Renal Failure/ Acute Kidney Injury
  - 8.2.5 End-Stage Renal Disease (Dialysis)
  - 8.2.6 Nephrolithiasis or Renal Calculi
- 8.3 Review Exercises

*Activity 1:* Diet Plan for Glomerulonephritis

*Activity 2:* Diet Plan for Nephrotic Syndrome

*Activity 3:* Diet Plan for Chronic Renal Failure

*Activity 4:* Diet Plan for Acute Renal Failure

*Activity 5:* Diet Plan for Dialysis

*Activity 6:* Diet Plan for Nephrolithiasis

---

## 8.1 INTRODUCTION

---

In this practical, our focus shall be on planning suitable diets for renal diseases. We shall review the various renal problems followed by the nutrient requirements during these conditions and the translation of nutritional requirements into suitable food sources as per the RDI so as to result in the development of an appropriate diet. Before you start studying this practical, we suggest you look up Unit 16 in the theory course Clinical and Therapeutic Nutrition (MFN-005) which presents a detail review on the various renal disorders covered in this practical.

### Objectives

After undertaking this practical you will be able to:

- describe the different renal disorders,
- discuss the dietary management of the renal disorders, and
- plan diets for patients suffering from glomerulonephritis, nephrotic syndrome, chronic/acute renal failure, end-stage renal disease and nephrolithiasis.

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## 8.2 RENAL DISEASES – AN OVERVIEW

---

Renal disease or diseases of the kidney are among the most ‘critical to treat’ disorders. Their treatment and management is still a challenge to medical science. Despite receiving prompt and efficient treatment; many of these diseases leave degenerative diseases that may increase the risk for the development of renal failure with advancing age.

Glomerulonephritis, nephrotic syndrome, chronic/acute renal failure, end-stage renal disease and nephrolithiasis are the most common forms of renal diseases. In the subsequent section, we shall learn about different types of renal disease and their dietary management.

## 8.2.1 Glomerulonephritis

Glomerulonephritis, as you may recall studying, refers to inflammation of the nephrons; the key functional unit of the kidney(s). It generally occurs due to the antigen- antibody reactions that occur in response to a particular infection (generally a streptococcal infection). It is characterized by fever, uremia (accumulation of nitrogenous waste products and other urinary constituents in blood), oedema, hypertension and oliguria/anuria (reduced or no urine output because of reduced GFR). Figure 8.1 illustrates the flow diagram for the development of glomerulonephritis. Going through the flow chart will help you recapitulate the progression of glomerulonephritis about which you have already studied in Unit 16 in the theory course.

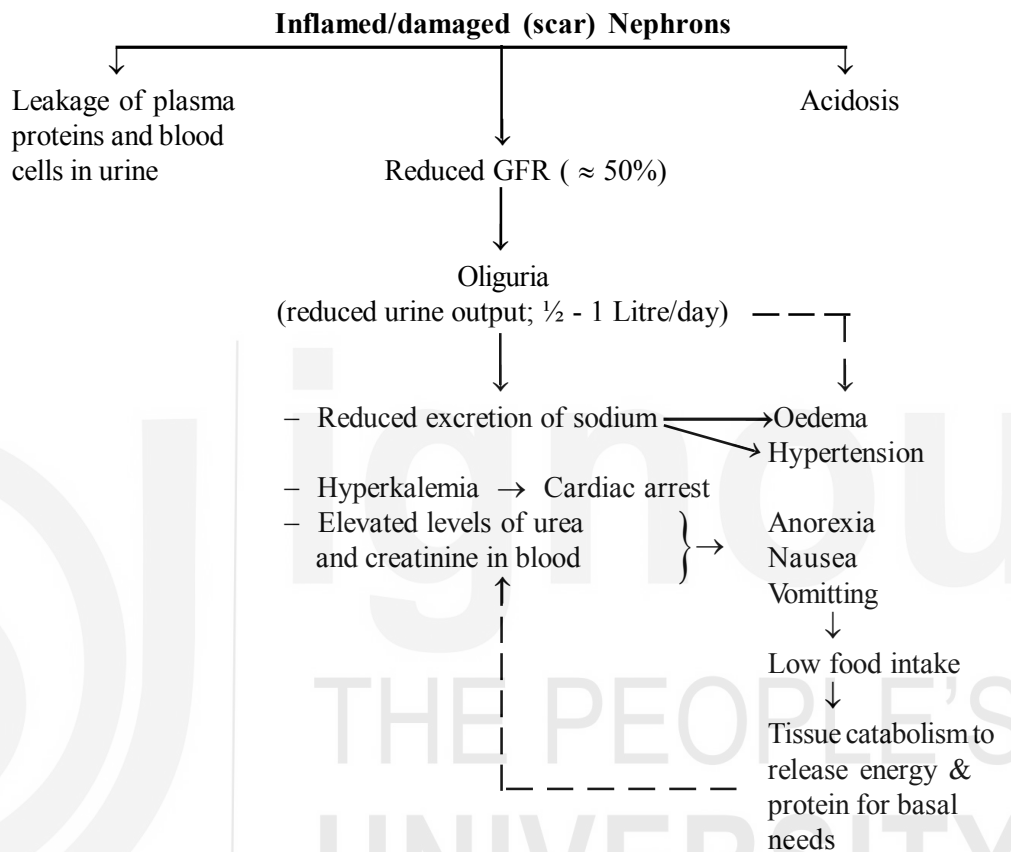


Figure 8.1: Flow diagram for glomerulonephritis

The treatment of glomerulonephritis is based on antibiotic therapy, complete bed rest and maintenance of optimum nutritional status. Let us review the dietary management of glomerulonephritis in greater details.

Dietary modifications of both macro- and micronutrients are required for the effective management of glomerulonephritis and is based on the following objectives:

### Objectives

The objectives of dietary management of glomerulonephritis are to:

- cure the underlying disease,
- reduce/prevent the severity of oedema and uremia,
- maintain fluid and electrolyte balance,
- maintain nitrogen balance, and
- help in maintaining an adequate nutritional status.

The nutrient needs for glomerulonephritis are enumerated next.

**Energy:** The total calories provided through diet to the patient depend upon the presence/absence of fever, current activity level (ambulatory/complete bed rest) and present body weight. Elevation of body temperature results in an increase in basal metabolic rate (BMR) and hence the energy intake may be increased by about 10%.

When patients are suggested complete bed rest; their energy expenditure on routine activities is minimal. In such cases, the energy intake may be reduced by 5% to 10% from the levels suggested by RDI for non-ambulatory patients. Adults may need 30-40 Kcal/kg dry weight and children about 100 Kcal/kg dry weight or more, based on age.

*Protein:* The protein intake should be calculated in accordance with the severity of uremia (blood urea nitrogen levels (BUN) and oliguria. Initially, 0.6 to 0.8 g protein/kg ideal body weight (IBW) is provided using principally high quality protein. Normal levels of protein (1 g/kg IBW) may be provided if BUN levels remain within the normal range.

**Note:** If the patient is suffering from oedema, the present body weight should not be used to calculate his protein intake. In such cases, the protein intake may be calculated on the following basis:

- The weight documented in his previous medical records (< 6 mths).
- Calculate patient's IBW based upon his height by using the formula:

**Men:** 48 kg for first 5ft + 2.7 kg for each additional inch

**Women:** 45.5 kg for first 5ft + 2.3 kg for each additional inch. ( $\pm 10\%$  for small/large build in both cases)

Since the protein intake is restricted, we must lay emphasis on high biological value or good quality proteins. Generally, proteins present in animal foods contain a higher proportion of essential amino acids as compared to those of plant origin. Eggs, milk and certain milk products (curd, paneer), meat, fish, poultry, whole pulses/legumes and their products particularly soyabean, soya-milk, tofu, texturized soya protein can help in improving the essential amino-acid content of the diet. Since cereals (wheat, wheat products, rice, maize etc) are poor sources of good quality protein; they are generally substituted by starch rich foods (potato, colocasia, yam, sago, arrowroot flour etc). Sago khichdi, scrambled egg, halwa, cottage cheese preparations, tofu or dal stuffed roti, substitution of soya milk for water in the preparation of pulses/legumes/vegetables/kneading of dough are good options for feeding these patients.

A sample menu for a glomerulonephritis patient is included here for your reference.

#### *Sample Menu*

Early Morning	Tea (Cream substituted for milk) Arrowroot biscuits
Breakfast	Sago porridge Potato stuffed roti
Mid Morning	Carrot halwa/ Potato halwa
Lunch	Vegetable Preparation Egg/Meat Preparation Arrowroot and wheat flour chappati
Evening Tea	Sago vada Tea
Dinner	Meat/paneer preparation Vegetable preparation Chappati Suji Ladoo
Bed Time	Sago-corn pudding

Next, let us study about the nephrotic syndrome.

## 8.2.2 Nephrotic Syndrome

Nephrotic syndrome referred to as ‘Nephrosis’, is characterized by impaired nephrons function and reduced reabsorptive capacity of renal tubules which results in massive proteinuria and severe oedema. It generally occurs among children. The clinical symptoms include proteinuria, haematuria, hyperalbuminemia, peripheral oedema, ascites, malnutrition etc. Figure 8.2 illustrates the progressive damage of nephrons a a result of nephrotic syndrome.

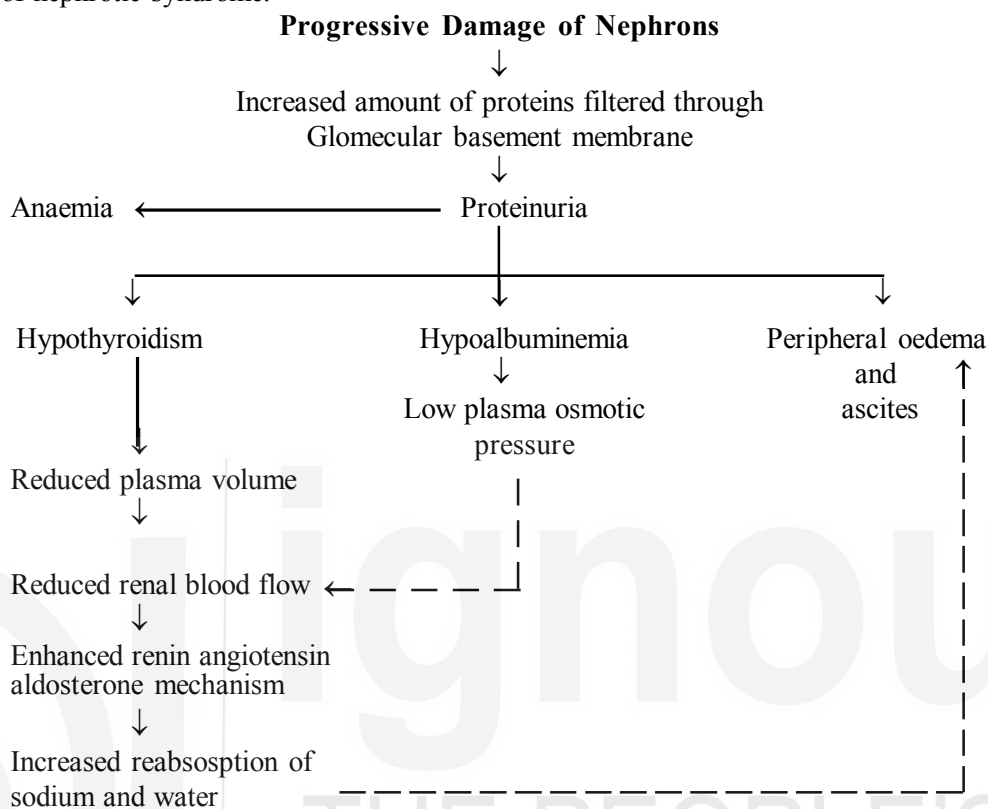


Figure 8.2: Flow diagram for nephrotic syndrome

The treatment of nephrotic syndrome is based on the cure of the underlying cause, maintain optimum nutritional status so as to prevent the onset of complications and handle undernutrition effectively. The dietary requirements for nephrotic syndrome patients is highlighted next.

**Energy:** Most of the nephrotic syndrome patients are severely malnourished and in a catabolic state. Adequate amount of energy is required to promote a positive energy balance so as to promote effective utilization of dietary proteins for the synthesis of blood proteins and also to prevent subsequent weight loss. The energy intake should be increased by 10% i.e. around 35-40 Kcal/kg ideal body weight in case of adults and about 100 Kcal/kg body weight for children.

**Protein:** Protein intake of 0.8 g/kg ideal body weight plus 1 g/g of proteinuria is recommended. This helps in maintaining a positive nitrogen balance which helps to promote hepatic synthesis of albumin and replenish body stores of plasma proteins. Emphasis should be laid on high biological value proteins such as milk, curd, paneer, egg whites, lean meats such as poultry/marine foods and whole pulses/legumes. Although animal proteins contain a higher proportion of essential amino acids as compared to plant proteins; they are also rich sources of sodium.

A combination of plant and animal protein food sources may be included in the diet. Besides, we should employ alternative methods of food preparation such as sprouting and fermentation which help to improve the bio-availability of proteins. Sprouted grain/legumes (rajmah, whole green gram dal, horse gram, Bengal gram, whole wheat) may



be added to any vegetable preparation, paranthas, pulaos, salads, raitas, sandwiches, cutlets, soups etc. Fermented dishes such as dosa, uttapam, idli, dhokla can also be included.

**Carbohydrates:** A high carbohydrate intake (~60 - 65% of total energy is generally recommended for protein sparing action). A combination of both simple and complex carbohydrates may be given. Dietary fibre intake may be slightly reduced if the patient is experiencing gastrointestinal disturbances. Emphasis should always be laid on soluble fibre and all high fibre foods should preferably be given in a soft cooked form. Carbohydrate foods help to reduce bulk and facilitate easier/faster digestion which can help in ensuring an adequate food intake. Since sago, arrowroot, yam, potato are low in sodium and easy to digest, they should be preferred over jowar, bajra, ragi etc. (high fibre) which are difficult to assimilate and may cause flatulence. Rice, suji, maida, wheat flour, breads/pastas (manufactured without using sodium salts) can be included in the diet.

**Fat:** Fat intake may remain normal or slightly restricted. Emphasis should be laid on the inclusion of vegetable oils which are low in saturated fats and are good sources of poly-unsaturated/mono-unsaturated fatty acids. Animal fats and red meats being high in saturated fatty acids and cholesterol may be avoided. The diet should not provide more than 200 mg cholesterol per day if the patient is hypercholesterolemic. Therefore, we must avoid cream, butter, ghee, margarine, hydrogenated fats (particularly bakery products), red meats (lamb, pork, buffalo, cow), egg yolk, whole milk, pistachios, cashewnuts etc. We must also avoid the inclusion of fried/high fat foods such as *mathris*, *namakparas*, *kachories*, certain biscuits, *khaties*, creamed cakes/pastries etc.

**Sodium:** Although the underlying cause of oedema is proteinuria; restrictions in the intake of sodium can help in preventing further accumulation of fluids and electrolytes. Approximately 2-3 g of sodium/day may be recommended. Usually added salt is prohibited in these patients. Refer to Table 16.2 in Unit 16 and Table 11.6 in Unit 11 in the theory course which presents the foodstuffs high in sodium. Avoid these foods in the diet of the nephrotic syndrome patient.

**Potassium:** Unlike glomerulonephritis, patients suffering from nephrotic syndrome may suffer from hypokalemia. Potassium deficiency may occur due to prolonged proteinuria and/or if the patients are being treated with diuretics. Pulses/legumes such as cowpea, green gram dal, red gram dal, brinjal, cauliflower, carrot, potato, papaya are fairly good sources of potassium. These may be included in the diet. If potassium levels get severely depleted, potassium salts such as potassium glutamate may be used for cooking. This can also help in improving the palatability of meals.

**Calcium:** In patients suffering from prolonged proteinuria, deficiency of specialized binding proteins may result in deficiency of calcium. This may result in bone rarefaction (bone pain and weakness). The blood phosphorus levels should also be checked regularly to assess the phosphorus status. Therefore, calcium supplementation along with moderate protein is recommended. Foods rich in calcium but low in sodium should be selected such as whole pulses/legumes (Bengal gram whole, black gram whole, green gram whole, rajmah, soyabean), carrots, beans, onion etc. Skimmed milk and milk products should be used in moderation in accordance with the sodium and fluid allowance of the patient.

**Other Vitamins and Minerals:** Most of the patients have a poor nutritional status. Although anaemia is principally due to loss of blood in urine and an impairment of the regulatory function of kidneys i.e reduced production of the erythropoietin factor; majority of the patients also have poor reserves of B-group vitamins such as folic acid, thiamin and riboflavin. Restrictions on the inclusion of fruits and vegetables make the diets poor sources of several water - soluble vitamins and minerals. Some food sources of vitamin C may be included in the diet such as amla, lemons, orange, guava depending upon the level of sodium restriction as it helps in wound healing. Though vitamin A plays an important role in cell multiplication/differentiation and also in maintaining the

integrity of epithelial cells; much stress on the inclusion of vitamin A rich foods/vitamin A supplements is not laid if the nephrotic syndrome is progressing towards renal failure. To promote calcium absorption and bone calcification, vitamin D may also be provided in sufficient amounts. Fats and fat rich food sources provide good amount of vitamin D but need to be restricted due to hypercholesterolemia. Thus, vitamin and mineral supplements may be required in severe situations.

*Fluids:* Fluid intake remains normal (~1500 ml/day) as there is no oliguria in patients suffering from nephrotic syndrome. However, if the condition progresses towards renal failure, fluid intake may be monitored in accordance with the urine output.

Some other useful tips for planning diet are also highlighted herewith.

### ***Useful tips for planning diet***

Since the patients are anorexic but at the same time have increased nutritional requirements, small nutrient dense meals should be served at frequent intervals. Thus, a 6-7 meal pattern (early-morning, breakfast, mid-morning, lunch, evening tea, dinner and bed-time) should be followed.

Majority of the patients being children, serving the meals attractively with variety in terms of colour, texture, taste, flavour and mouthfeel can prove to be beneficial in improving the overall intake of the patient. For example; an orange/strawberry sugar toffee (sugar hardball/candy) can be crushed and sprinkled over curd/sago porridge to make it appear attractive.

A variety of cooking methods should be employed. Use of non-stick cook ware, baking, boiling, roasting and microwave cooking may be helpful.

Small amounts of alternative flavourings such as small amounts of coriander, mint, ginger, lemon drops, cardamom, clove, drumstick may be used to improve the palatability of meals.

Most of the protein rich food sources particularly those of animal origin is also high in their sodium content. This may restrict their intake. Thus, if the patient is suffering from severe proteinuria and oedema; protein supplements such as whey protein, soya protein and casein may be added to the meals to increase the protein intake. These can be sprinkled over cooked dishes, mixed with flours while kneading dough or mixed with curd/milk.

If the patient is hypercholesterolemic, we should avoid foods high in cholesterol and/or saturated fats. Thus, egg yolks, red meats, whole milk/whole milk products and majority of nuts should be strictly avoided.

Next, we move on to chronic renal failure.

### **8.2.3 Chronic Renal Failure**

Chronic renal failure (CRF) is a condition characterized by progressive loss of renal tissues which affects the excretory, regulatory and metabolic functions of the kidneys. The clinical symptoms include reduced glomerular filtration rate, uremia (elevated blood urea and creatinine), nocturia, overhydration/dehydration, anaemia etc.

All these symptoms and the progression of chronic renal failure also referred to as 'chronic kidney disease' have been discussed in the Theory Manual (MFN-005) in Unit 16. Let us quickly take an overview of the various stages/symptoms that take place during the development progression of CRF which are illustrated in Figure 8.3.

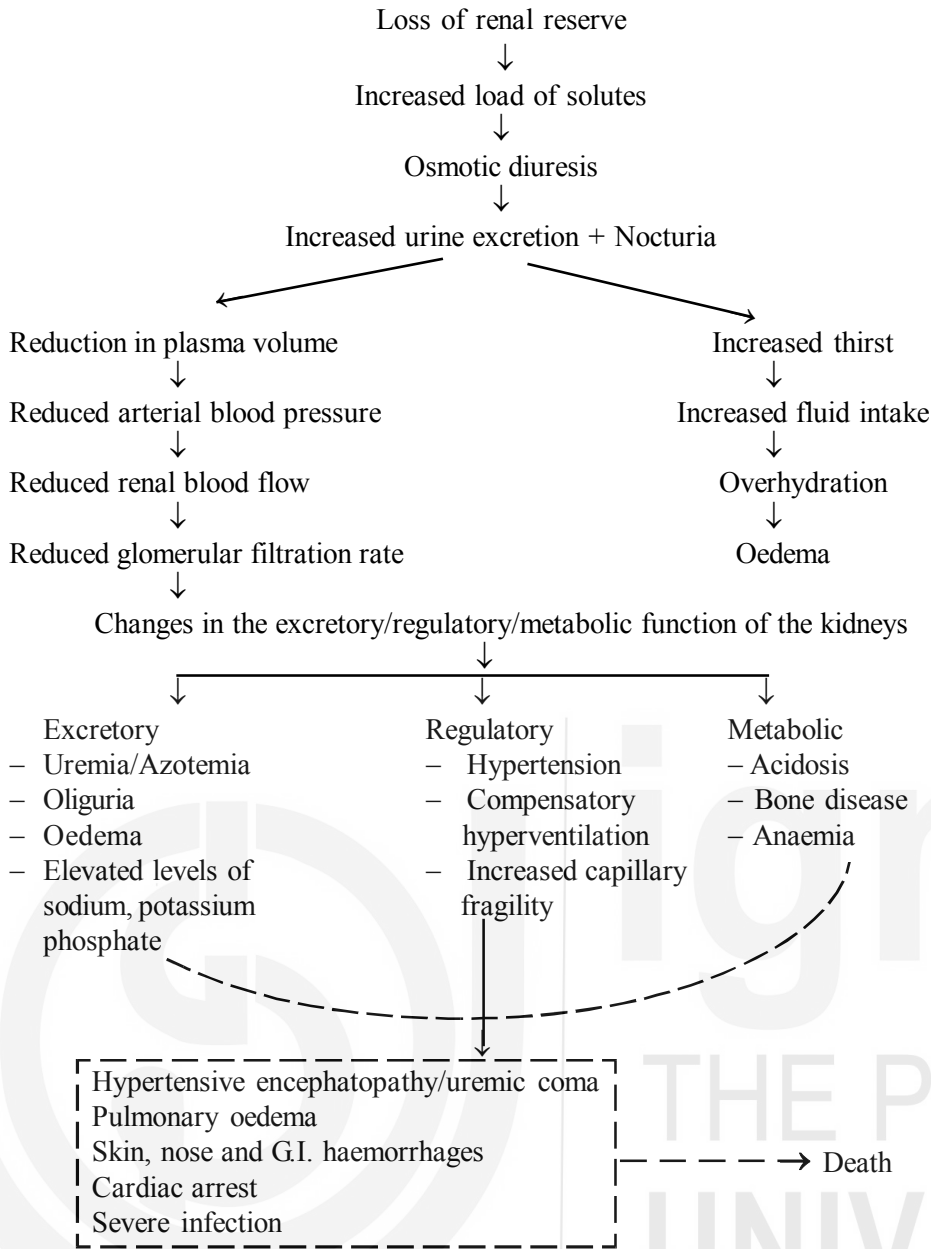


Figure 8.3: Flow diagram for CRF

Let us now discuss the various principles of dietary management that are essential for the effective treatment of chronic renal failure (CRF) which is also referred to as chronic kidney disease (CKD). While regression of CRF is usually not possible, as a Dietitian our endeavour should be to prevent the progression and delay the onset/severity of complications. The various objectives (which must be identified in terms of their priority) can be outlined as mentioned below.

### Objectives

The objectives of dietary management of chronic renal failure are to:

- prevent/control uremia and tissue catabolism,
- maintain fluid and electrolyte balance,
- correct acidosis,
- prevent the onset and/or manage/treat the complications arising due to renal degeneration,
- prevent further progression of Kidney damage, and
- maintain an optimum nutritional status.

Nutritional modifications are particularly crucial in case of protein, cholesterol, sodium, potassium, phosphate, calcium and water intake. Before we begin to prepare a diet

plan, let us brief ourselves regarding the changes in the quantity/quality of foodstuffs for each nutrient. Refer to Table 8.1 for the dietary guidelines.

**Table 8.1: Dietary guidelines for CRF**

Nutrients	Comments
<b>Energy</b>	30-40 Kcal/kg/day for adults and 100-150 Kcal/kg/day for children.
<b>Carbohydrates</b>	300-400 g/day to avoid endogenous protein catabolism, gluconeogenesis and subsequently uremia.
<b>Proteins</b>	0.6-0.8 g/kg/day, with 60-70% as high BV protein. To reduce N <sub>2</sub> load, a mixture of essential amino acids is recommended.
<b>Sodium</b>	500 mg - 2.0 g/day. Additional Na in case of weight loss and decreasing urine volume and restriction of Na in case of oedema and hypertension.
<b>Potassium</b>	Intake must be kept at 1500 mg/day (3.0 mEq/day) and in case of significant losses, potassium supplements should be given.
<b>Calcium and Phosphorous</b>	Calcium supplementation – 1 to 2 g/day and phosphate to be restricted to 800-1200 mg/day
<b>Vitamin</b>	Multivitamin supplements, specially vitamin D <sub>3</sub>
<b>Fluid</b>	Intake is dependent on urine output and water balance.

Leaching of foods can lower the sodium and potassium content of foods. Read the information in Box 8.1 for more information on this topic.

Box 8.1	Leaching of Foods can Lower their Sodium and Potassium Content.
<p><b>How can we leach vegetables and certain fruits?</b></p> <ol style="list-style-type: none"> <li>1. Peel the vegetable/fruit, cut into small pieces and place in a large pot of water.</li> <li>2. Rinse the vegetable/fruit.</li> <li>3. Fill the pot with clean water and let the vegetable soak for atleast 4 hours at room temperature (overnight, if in refrigerator).</li> <li>4. After soaking, rinse the vegetables.</li> <li>5. Discard water.</li> <li>6. Cook as desired and limit the portion size to no more than ½ cup.</li> </ol> <p><b>Note:</b></p> <ul style="list-style-type: none"> <li>– Cauliflower, mushrooms, carrots, peas, potato, bottlegourd, guava etc. can easily be leached.</li> <li>– Avoid vegetables/fruits which have a soft mushy texture (tomatoes, pumpkin, bananas.....) as they would get dissolved in water during the process of soaking.</li> </ul> <p><b>Disadvantage:</b> Leaching not only reduces the sodium and potassium content; it also lowers the amount of water soluble vitamins and several minerals. It should preferably be practiced only when sodium intake is restricted to ~500 mg/day.</p>	

Further, hyperkalemia has been found to be a critical factor related to morbidity and mortality among CRF patients. Therefore, potassium levels in blood can be maintained by:

- Avoiding processed foods.
- Avoiding ‘low salt’ snacks/ready-to-eat foods, if table salt (NaCl) has been substituted by a potassium salt.
- Consuming a small serving size of fruits and vegetables even if they are inherently low in potassium.
- Adhering to the dialysis schedule.

We should choose low/high potassium foods (listed in Box 8.2) according to the blood potassium levels.

<b>Box 8.2</b>			
<b>Food Sources of Potassium</b>			
<b>Food</b>	<b>&gt;300 mg/ 100 g (High Sources of Potassium)</b>	<b>200-300 mg/ 100g (Medium Source of Potassium)</b>	<b>&lt;200 mg/ 100g (Low sources of Potassium)</b>
<b>Fruits</b>	Avocados, Bananas, Dried fruits, Kiwi, Apricot, Dried Orange/prune juice.	Berries, Grapes, Lemon, Peaches, Plum, Pineapple, Watermelon, Cherries	Mango, Papaya, Orange, Apple, Litchi
<b>Vegetables</b>	Artichoke, Dried beans and Potato, Cooked spinach, Sweet potato, Vegetable soup, Cauliflower	Tomato, Cabbage, Eggplant, Green Beans, Lettuce, Onions, peas, Bitter gourd (short), Pumpkin (Orange, round)	Bottle Gourd, Pumpkin (Green, Cylindrical), Cucumber
<b>Dairy</b>	Khoa, Yoghurt, Ice-cream.	Non-dairy creamers, Rice milk (unenriched), Non-dairy whipped toppings.	Milk, Paneer
<b>Snacks</b>	Chocolate, Seeds & nuts, Salt substitutes	Sorbet, Jelly, Hard Candies, Plain Donuts, Unsalted Popcorn.	

Source: Compiled from Indian Food Composition Tables, ICMR, 2017

Few other useful tips are highlighted herewith.

**Useful Tips for Planning the Diet**

- Since most of the patients are anorexic, it is important to give small frequent meals; a 6-7 meal pattern can be helpful in feeding adequate amount of food.
- Keeping in view the bad taste in mouth; the meals should have a variety of flavour, colour, texture, taste and mouthfeel.
- If the fluid allowance is restricted, the patients may experience thirst, dry tongue/mouth and difficulty in swallowing dry meals. In such cases, include saliva stimulants (very small amounts) in meals such as lemon drops, mint, mango powder, dry pomegranate seeds etc. Some of these may also help in improving the flavour of meals. The patient may also be advised to hold thin slices of ice, leached fruit slices between lips but should not swallow them. Use of certain sodium-free mouth washes can also provide temporary relief from the fetid odour in mouth.
- The patient should be accurately weighed atleast once in every 24 hours. Any gain in weight would be an indicator of fluid retention (oedema) in the body indicating worsening of the disease condition. In such situations, changes may be required in the fluid allowance along with nutrient modifications. The plan of action for dialysis Renal Replacement Therapy (RRT) may also be required to be initiated.

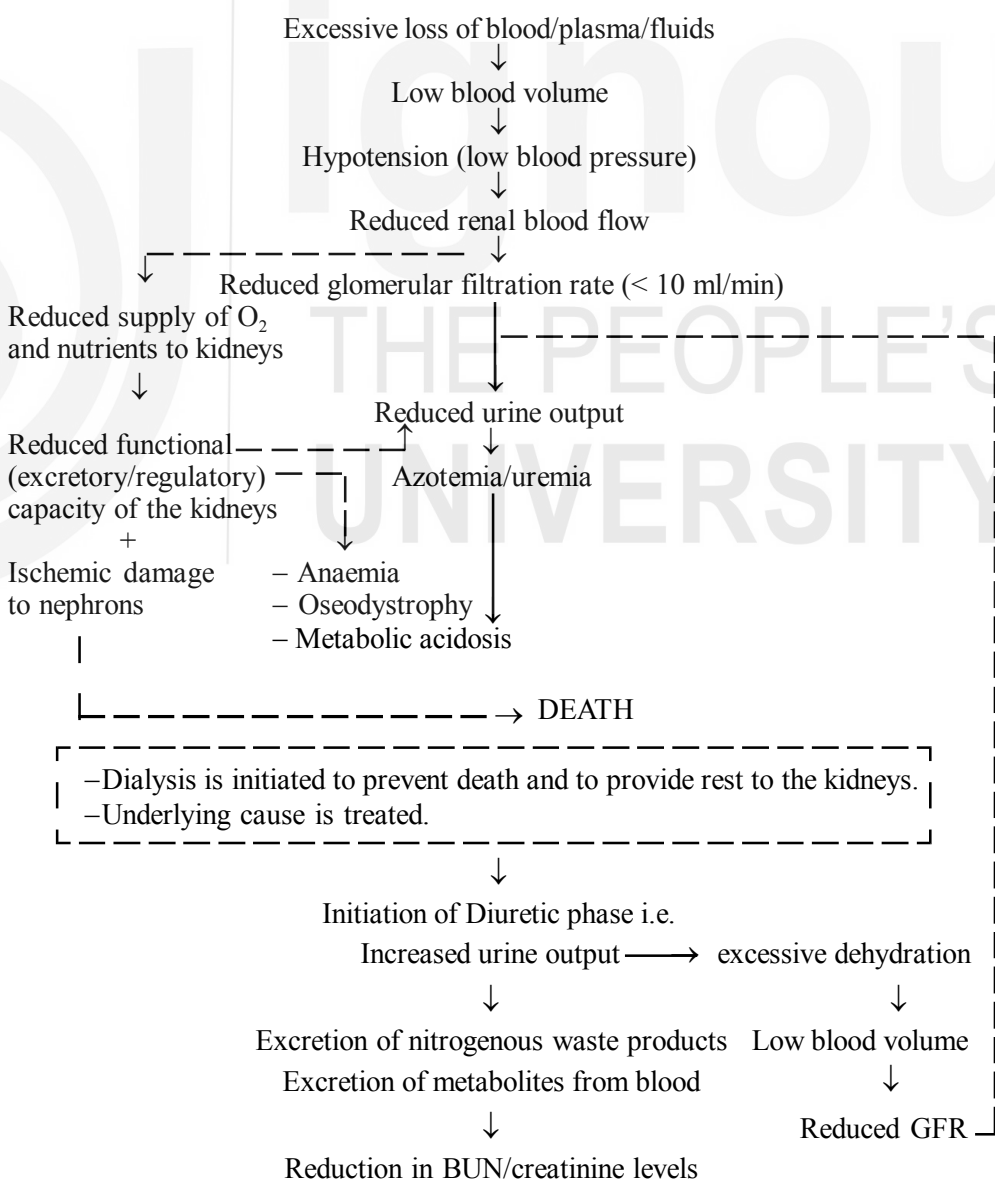
- Several tube feeds are exclusively available for renal patients. These may be given when the nutrient requirements of the patient can not be met by the naturally available foods. Tube feeds are generally given during stage V of CRF.
- Leaching of vegetables and fruits (where feasible) reduces the water soluble vitamin/mineral content apart from that of sodium and potassium. Thus, nutritional deficiencies need to be prevented by giving adequate amount of supplements.
- Patient and family counseling regarding dietary restrictions is very important for both indoor and OPD patients.

Next a brief review on acute renal failure.

### 8.2.4 Acute Kidney Injury (Acute Renal Failure)

When the kidneys are not able to maintain the normal concentration of composition of blood, it is called 'renal failure'.

Acute renal failure can be described as a condition characterized by sudden stoppage of renal function following either a traumatic injury or some other metabolic disturbances in the body and is associated with a sharp reduction in the glomerular filtration rate (GFR below 10 ml/min); thereby indicating that the functional capacity of kidneys has reduced by nearly 90%. Figure 8.4 illustrates the flow diagram for acute renal failure which will help you understand the progression of the disease condition.



**Figure 8.4: Flow diagram for acute renal failure**

The treatment of acute renal failure is based on management and cure of the underlying cause, kidney dialysis, dietary management and complete bed rest. The dietary guidelines for acute renal failure are summarized in Table 8.2 for your easy reference.

**Table 8.2: Dietary guidelines in acute renal failure**

Nutrients	Comments
<b>Protein</b>	Unnecessarily protein restriction should not be practiced in AKI. If not on dialysis, 0.8-1 g/kg/day. If on dialysis, 1-1.5 g/kg. If on renal replacement therapy (RRT) and upto maximum of 1.7 g/kg/ d for continuous renal replacement therapy (CRRT) from dietary or parenteral sources (KDIGO, 2012).
<b>Kilocalories</b>	Provide sufficient amount for weight maintenance or 25-30 Kcal/Kg body height. Increase to 30-35 Kcal/kg in hypercatabolic subjects. Encourage non-protein calories from fats and simple carbohydrates.
<b>Sodium</b>	In oliguric phase, restrict to 500-1000 mg (20-40 mEq). On diuresis, the amount may be increased.
<b>Potassium</b>	If hyperkalemia present, restrict to 1000-2000 mg (25-50 mEq). On improvement, increase to 60-70 mEq.
<b>Fluids</b>	Limit fluids of an amount equal to urine volume plus 500 ml.

**General considerations for the patient**

- If oral intake is feasible, a 6-7 meal pattern should be adopted.
- During the oliguric phase, the diet may need to be supplemented with enteral/parenteral nutrition particularly to meet the protein and sodium requirements of the patient.
- Since most patients are anorexic and have dry mouth due to restrictions in fluid intake during the oliguric phase; attempts must be made to introduce variety in terms of colour, texture, taste, flavours, mouthfeel, variety of dry heat cooking methods and saliva stimulants (small amounts of herbs, condiments) may be useful in improving food intake.
- Fluid intake should be monitored carefully in accordance with the urine output and oedema (if any).
- Counseling and preparation for renal replacement therapy of the patient should be carried out with sensitive care.
- Techniques such as continuous arteriovenous haemofiltration and nutritional dialysis may help in improving the emancipated condition of the patient and/or may help in releasing the dietary restrictions slightly.

A sample menu for an acute renal patient is given here for your reference.

<b>Early Morning</b> Tea (with cream and sugar) Arrowroot biscuits (2)	<b>Breakfast</b> One Egg white Bread slices (2) Jam/Unsalted butter Sago Kanji (optional-fluid allowance)	<b>Mid-Morning</b> Rice/Sago Kheer
<b>Lunch/Dinner</b> Chappati Rice Curd (1/2 serving)/Paneer Vegetable preparation (leached)	<b>Evening</b> Rice kanji (optional) Sago wada Potato fingers/ Brownies	<b>After Dinner</b> Potato halwa (1/2 serving)

**Note:**

- Sugar, honey, dextrose, unsalted cream, cooking oil should be used liberally to increase the energy content of diet.
- Table/cooking salt should not be used. Vegetables (where feasible) should be leached to reduce their sodium and potassium content.

Next, let us review the end stage renal disease.

**8.2.5 End-Stage Renal Disease/Nutritional Management during Dialysis**

End-Stage Renal Disease (ESRD) can be clinically defined as a state of chronic kidney disease when the glomerular filtration rate falls below 15 ml/min. This stage usually required the initiation of “Renal Replacement Therapy”. Dietary management and drugs can only help in delaying the need for renal replacement therapy (RRT). RRT generally involves kidney dialysis and/or kidney transplantation about which you have already studied in the theory course. We suggest you look up Unit 16, sub-section 16.10.2 once again for a better understanding of dietary management of this condition. Here for your understanding nutritional care during dialysis are highlighted in Table 8.3.

**Table 8.3 : Dietary Guidelines during dialysis**

Nutrients	Comments
Energy	30-40 Kcal/Kg/day for adults and 100 Kcal/Kg/day for children
Carbohydrates	300-400 Kcal for protein sparing action.
Proteins dialysis	1.2g/Kg/day in hemodialysis and 1.2-1.5 g/kg/day in peritoneal
Sodium	1500-2500 mg/day. This helps to prevent pulmonary oedema or congestive heart failure.
Potassium	1500-2500 mg/day is prescribed to prevent hyperkalemia.
Phosphorus	800-1200 mg/day if the serum phosphate level rises above 5.5 mg/dl or pH levels are $\geq 300$ pg/ml
Vitamin	Supplements usually given as these are lost in dialysate.
Fluid	Individualized according to urine output.

Fluid management during ESRD is also an important issue. It is restricted according to urine output of patient. Therefore Box 8.3 present general formula and important information related to calculation of fluid allowances for end stage renal diseases.

<b>Box 8.3</b>	<b>How can We Calculate Fluid Allowance for 24 hours?</b>
<p><b>Formula :</b></p> $\text{Fluid (24 hours)} = \text{Insensible losses (500 ml)} + \text{Urine output in previous 24 hours} + \text{Fluid losses due to diarrhoea/vomitting}$ <p>Fluid losses due to diarrhoea/ vomiting</p> <p>Remember, we are here referring to the term “fluid” and not “water”. Thus, the fluid allowance calculate will include:</p> <ul style="list-style-type: none"> <li>- Moisture present in food (ICMR food composition table)</li> <li>- Water present in prepared dishes (curries, vegetable preparations, curd etc.)</li> <li>- Water used in beverages or as such for taking medicines</li> <li>- Water as a beverage to quench thirst.</li> </ul> <p>Spraying mouth washes, sucking ice-chips/chilled fruit/lemon drops or chewing gums containing citric acid can be helpful when fluid is restricted.</p>	



Finally, let us study about nephrolithiasis.

## 8.2.6 Nephrolithiasis or Renal Calculi

As we all know, both environmental and nutritional factors have been shown to affect stone nucleation and growth by their effects on urinary constituents and pH. The formation of stones requires supersaturated urine, the greater the concentrations of ions the more likely they are to precipitate. The concentration of ion depends on the urinary pH, ionic strength and solute concentration. All these are very closely associated with the quantity and quality of food (nutrients) we eat. So let us quickly brief ourselves regarding the dietary management for various forms of renal calculi. We begin with the objectives of dietary management.

### Objectives

The objectives of dietary management of renal stones are:

- to bring about a change in the pH of urine by adjusting the pH of diet,
- to reduce the solute content of urine, and
- to promote excretion of calculi constituents in a bound form.
- Calcium Stones
- Uric Acid Stones
- Struvite Stones
- Cystine Stones

Although, role of diet in the formation of urinary stones is not well established, it is advisable to have liberal fluid intake, a balanced diet and restrict foods based on the main constituent of the stones. Table 8.4 gives information related to different stones and their corresponding diet restriction.

**Table 8.4: Different stones and their corresponding diet restrictions**

Main Constituents	Diet Restriction	Urine pH
<ul style="list-style-type: none"> <li>● Calcium stones</li> <li>– phosphate</li> <li>– oxalate</li> </ul>	Calcium – 400-600 mg Phosphorus – 1000-1200 mg	Acid
<ul style="list-style-type: none"> <li>● Struvite stones</li> </ul>	Low phosphorus	Acid
<ul style="list-style-type: none"> <li>● Uric acid</li> </ul>	Low purine	Alkaline
<ul style="list-style-type: none"> <li>● Cystine</li> </ul>	Low methionine	Alkaline

Besides liberal fluid intake and some dietary restriction, urine pH control helps based on the chemical composition of the stone, mainly via acidifying or alkalinizing agents or diet. Binding agents to bind the stone constituent may also be used.

Enlisted below are a few examples of low, moderate and high sources of oxalic acid and also food sources of phosphorous. You may use this information while planning diets for renal stone patients where oxalate or phosphorous needs to be restricted.

**FOOD STUFF ACCORDING TO THEIR OXALIC ACID CONTENT**

<b>Low</b> ( <b>&lt; 2 mg/100 g</b> <b>edible portion</b> )	<b>Moderate</b> ( <b>2-10 mg/100 g</b> <b>edible portion</b> )	<b>High</b> ( <b>&gt;10 mg/100 g</b> <b>edible portion</b> )
Rice Green gram dal Red gram dal Watermelon Plum Maize, Sweet Beans Bottle gourd Dates Star fruit	Barley Maize, tender Lentil dal Bengal gram whole/dal Cabbage Banana Pineapple, Poha, Rice, puffed Papaya Cherries	Wheat Jowar Bajra Most leafy vegetables Beet root Drum sticks Lotus stem (dry) Almonds Cashewnuts Gingely seeds Amla Seetaphal Apple Beef Cowpea Lady finger

**FOOD SOURCES OF PHOSPHORUS**  
**mg/100 gm edible portion**

<b>Low</b> ( <b>&lt;50 mg</b> )	<b>Moderate</b> ( <b>&gt;50-100 mg</b> )	<b>High</b> ( <b>&gt; 100 mg</b> )
Cabbage Lettuce Spinach Potato Turnip Most fruits (except bale, dates, Apricot dried) Beet root Cauliflower Cucumber	Vermicelli Fenugreek Leaves Bathua Amarnath Lotus stem Capsicum Broad beans Raisins Dates	Most cereals (except Vermicelli) All pulses

With this, we end our study about the renal diseases and their dietary management. To recapitulate what you have learnt so far, we suggest you undertake the review exercises given next. These are self check exercises. Once you have attempted them successfully, you can move on to the activities included here in this practical. There are 5 activities, which will provide you hands down experience of planning diets for various renal conditions.

**8.3 REVIEW EXERCISES**

- 1) What would be the fluid allowance for a glomerulonephritis patient whose urine output was 473 ml in the previous 24 hrs.

*Step 1:* Write the formula for calculating fluid allowance.

*Step 2:* Put figures in the formula and derive the intake.

- 2) Comment upon the quality and quantity of protein to be included in the diet of 7 year old girl suffering from nephritic syndrome.

Quality: .....

.....

Quantity: .....

.....

- 3) While planning diet for nephritic syndrome, why do we lay stress on the inclusion of a combination of “starches and cereals” rather than “cereals only” in the diet.

.....

.....

- 4) Explain the step-wise process of leaching. What are its advantages/ disadvantages.

.....

.....

Advantages	Disadvantages

- 5) What suggestions would you give to a patient suffering from CRF who is experiencing severe thirst, dry tongue and mouth due to strict fluid restrictions?

.....

.....

- 6) Identify any four nutrients; the intake of which may significantly influence the prognosis of CRF. Give reasons for the selection of these nutrients.

	Nutrients	Increased/Decreased intake	Reason
1)			
2)			
3)			
4)			

- 7) What changes should be brought in the sodium, potassium and fluid intake of ARF patients?

.....

.....

- 8) Choose any ten processed food-stuffs and enlist the name of the preservative/ additive present in them.

**Name of the foods stuff**

**Preservative/additive**

1) Processed chicken

2) Canned Beans

- 3) Butter Cookies
- 4) Ketchup
- 5) ....
- 6) ....
- 7) ....
- 8) ....
- 9) ....
- 10) ....

How many of these foods contain a sodium preservative/additive which contains sodium.

- 9) Enlist at least five food stuffs which are poor/moderate/rich sources of oxalate.

<b>Low</b>	<b>Moderate</b>	<b>High</b>
------------	-----------------	-------------

- 1)
- 2)
- 3)
- 4)
- 5)

- 10) What is the RDI of calcium for an adult man/woman? What level of calcium restriction is suggested for a patient suffering from calcium phosphate stones?

.....  
 .....

- 11) How can we increase the fluid intake of patients suffering from uric acid stones? Enlist atleast five points.

- 1)
- 2)
- 3)
- 4)
- 5)

- 12) Using the food composition table, enlist atleast five low sodium (< 50 mg/100 gm edible portion) and five low potassium fruits and vegetables each. Write in ascending order.

**Low Sodium**

**Fruits**

**Vegetables**

- |    |    |
|----|----|
| 1) | 1) |
| 2) | 2) |
| 3) | 3) |
| 4) | 4) |
| 5) | 5) |

**Low Potassium**

**Fruits**

**Vegetables**

- |    |    |
|----|----|
| 1) | 1) |
| 2) | 2) |
| 3) | 3) |
| 4) | 4) |
| 5) | 5) |

**DIET PLAN FOR GLOMERULONEPHRITIS**

**Aim** : To plan a diet for an individual suffering from glomerulonephritis.

Date :

**Case Study** : Meenu is an 11 year old girl from a middle income group family, suffering from glomerulonephritis. She is having elevated BUN levels and creatinine. Her feet are swollen indicating fluid retention and her urine output was 710 ml yesterday. She is severely anorexic and has been advised complete bed rest during her stay at the hospital. Plan a diet for Meenu.

Start the exercise by presenting a brief introduction on Meenu disease condition.

**Introduction****Step I : Patient's Profile**

Read the case study carefully and identify the important points that may determine nutrient intake/diet planning.

*Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

**Step II: Assessment of the nutritional needs of the patient**

Hint: For this, first identify the key symptoms which are most crucial for the treatment of the disease. For instance, in this case, nitrogenous waste products being toxic; treatment control of oliguria and hence uremia is more important. Based upon the symptoms, identify the nutrients that need to be modified in terms of quantity/quality and record them in the format given herewith. Protein, fluid and sodium intake would therefore be modified in view of uremia, oliguria, oedema and hypertension. You may refer to the nutrient requirements for glomerulonephritis discussed earlier in sub-section 8.2.1. Refer to Table 1.1 and identify the energy and protein allowances of a healthy 11 years old girl. Record these values under normal column given next.

### Recommended Dietary Intake for 24 hours

	Normal	Modified
Energy (Kcal)		
Protein (g)		
Sodium (g)		
Potassium (mg)		
Fluids (ml)		

Always work out your calculations for reaching the modified RDI. Record those in the space provided herewith.

**Calculations:**

**Step III: Based upon the modified RDI, select exchanges for each food group.**

(Record the exchanges in the format given herewith).

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrates (g)	Fats (g)
Milk					
Meat					
Pulse					
Cereal					
Starches/ Roots/Tubers					
Other Vegetable					
Leafy Vegetable					
Fruit					
Sugar					
Fat					
<b>Total</b>					

**Step IV: Distribute the food exchange**

Distribute the above selected exchanges according to the meal pattern most suitable for the patient.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	Bed Time
Milk								
Meat								
Pulse								
Cereal								
Starches Roots/Tubers								
Other Vegetables								
Leafy Vegetables								
Fruit								
Sugar								
Fat								

**Step V: Plan a menu for Meenu**

Using the exchange available for each meal, prepare a menu for Meenu by selecting the most appropriate foodstuffs (nutritional needs of the patient).

**Menu for Meenu**

Early Morning	Breakfast	Mid Morning	Lunch	Evening Tea	Dinner	Bed Time

**Step VI: Detailed meal plan**

Select appropriate quantities for each dish as per the exchanges available and calculate sodium and potassium (K) content for the detailed diet plan.

Meal	Menu	Ingredient	Amt. (g)	Exchange	Energy (Kcal)	Protein (g)	Sodium (mg)	Potassium (mg)
<b>Total</b>								



### Conclusion

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

Nutrient	Amount Computed through Diet Plan	Amount Computed for Modified RDI	$\pm$ % of Difference	Suggestions for Improvement
Energy (Kcal)				
Protein (g)				
Sodium (mg)				
Potassium (mg)				

*What counseling tips would you give to Meenu or her care-givers regarding the food choices/intake (give special emphasis to sodium intake)?*

**Submit the activity for evaluation.**

---

**Counselor's Signature**

## ACTIVITY

# 2

## DIET PLAN FOR NEPHROTIC SYNDROME

Date :

**Aim** : To plan a diet for a patient suffering from nephrotic syndrome.

**Case Study** : Vishal is an 5 year old boy studying in a public school. He was admitted to the renal ward of hospital with marked abdominal oedema and ascites. The results of medical examinations are indicative of hypoalbuminemia and severe urine protein loss of  $\geq 2\text{g/day}$  with elevated serum cholesterol levels. Some of his clinical parameters are as follows:

Previous day urine output	: 400 ml
Serum albumin	: 2.2 g/dl
Total serum protein	: 5.1 g/dl
Haemoglobin	: 5.3 g/dl
Serum sodium	: 151 meq/l
Serum cholesterol	: 280 mg/dl

Vishal is fond of non-vegetarian foods and bakery products. He is being given mild diuretics and shall be kept under observation in the hospital for atleast 15 days. Plan a diet for Kanak.

### Introduction

(Begin the activity by first describing Vishal's disease condition. Also, identify five most critical symptoms that would influence the dietary intake of the patient and the objectives of the dietary management of her disease condition).

*Symptoms:*

- 1)
- 2)
- 3)
- 4)
- 5)

## Objectives of dietary management:

### Step I : Patient's Profile

Keeping the case details in mind, fill the patient profile in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Pathophysiological stress:

Diet prescribed:

Also, compare the biochemical/clinical parameters of the patient with the normal values.

<b>Parameter</b>	<b>Patient Value</b>	<b>Normal Value</b>	<b>Inference</b>
Serum albumin			
Total serum protein			
Haemoglobin			
Serum sodium			
Serum cholesterol			

## Step II : Assessment nutrient requirement

On the basis of case details and principles of diet planning for Nephrotic syndrome, assess/calculate the nutrient needs of Vishal and compare them with the RDI of a healthy boy (age specific).

### Recommended Dietary Intake

Nutrient	Normal	Modified
Energy (Kcal)		
Protein (g)		
Carbohydrate (g)		
Fat (g)		
Cholesterol (mg)		
Iron (mg)		
Calcium (mg)		

Work out your calculations for reaching the modified RDI in the space provided herewith.

*Calculations:*

## Step III : Select the food exchanges

Select appropriate food exchanges that would help in meeting the nutritional needs of Vishal. Do remember to select food exchange which would help in providing good amounts of protein but low in saturated fat, cholesterol and sodium.

Exchange	No.	Energy (Kcal)	Protein (g)	CHO (g)	Fat (g)
Skim Milk					
Meat					
Pulse					
Cereal					
Roots/Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Sugar					
Fat (oil)					
<b>Total</b>					

**Step IV : Distribute the above selected exchanges according to the meal pattern most suitable for the patient.**

(Hint: Since the patient is complaining of abdominal fullness due to ascites; a small frequent meal pattern should be adopted to promote adequate food intake and hence help in maintaining a good nutritional status).

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	After Dinner
S. Milk								
Meat								
Pulse								
Cereal								
Starches Root/Tubers								
Other Vegetables								
Leafy Vegetables								
Fruit								
Sugar								
Fat								

**Step V : Plan a day's menu for Kanak**

Prepare a day's menu for Kanak .Try to lay emphasis on snacks/dishes preferred/liked by young children. Select the dishes as per the exchanges available for each meal in step IV above.

**Sample Menu for Kanak**

Early Morning	Breakfast	Mid Morning	Lunch	Evening Tea	Dinner	Bed Time



### Conclusion

Finally, compare the amount of each nutrient provided through the detailed menu plan with the modified nutritional needs. Give your interpretations and suggestions for improvement.

<b>Nutrient</b>	<b>Amount Computed for Modified RDI</b>	<b>Amount Computed through Diet Plan</b>	<b>± % of Difference</b>	<b>Suggestions for Improvement</b>
Energy (Kcal)				
Protein (g)				
Cholesterol (mg)				
Iron (mg)				
Calcium (mg)				

Submit the activity for evaluation.

---

**Counselor's Signature**

## ACTIVITY

# 3

## DIET PLAN FOR CHRONIC RENAL FAILURE

Date :

**Aim** : To plan a diet for a patient suffering from chronic renal failure.

**Case Study** : Mrs. Darshan is a 65 years old woman who was admitted to the ICU of renal ward. She had oedema, pale conjunctiva, shortness of breath, chest pain, parasthesia and reduced urine output. She was experiencing severe gastrointestinal disturbances such as anorexia, nausea and vomiting due to which her food intake has reduced drastically. Clinical diagnosis was indicative of chronic renal failure with mild hyperkalemia, metabolic acidosis and hypertension. Some of her clinical parameters are:

Glomerular filtration rate	:	20 ml/min
Serum bicarbonates	:	12 meq/L
Serum potassium	:	5.3 meq/L
Systolic blood pressure	:	156 mmHg
Diastolic blood pressure	:	98 mmHg
Serum sodium	:	150 meq/l
Serum creatinine	:	1.9 mg/dl
Blood Urea Nitrogen	:	29 mg/dl
Urine output in previous 24 hrs.	:	326 ml

Her medical reports have been forwarded to the dietitian to help the patient with dietary counseling and also to plan diet for Mrs. Darshan during her hospital stay. Now plan a diet for Mrs. Darshan.

Start the exercise with the introduction.

### Introduction

(Describe the clinical condition which the patient is suffering from. Enlist atleast five characteristic symptoms of CRF and the objectives of dietary management of CRF, in the space provided herewith).



### Step I : Patient's Profile

Now, read the case carefully and fill the patient profile in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

Next, compare the patient's clinical parameters with the normal values/standard values. (Refer to Table 16.1, Unit 16 in MFN-005 theory course for standard values).

Patient Value	Normal Values/range
Glomerular filtration rate	
Serum bicarbonates	
Serum potassium	
Systolic blood pressure	
Diastolic blood pressure:	
Serum sodium	
Serum creatinine	
Blood Urea Nitrogen	

### Step II: Assess the nutrient requirement of Mrs. Darshan

Based upon your understanding of the disease condition and the patient's profile, assess/calculate the nutritional needs of Mrs. Darshan and compare them with the RDI for a sedentary elderly woman.

#### Recommended Dietary Intake

Nutrient	Normal	Modified
Energy (Kcal)		
Protein (g)		
Sodium (mg)		
Potassium (mg)		
Iron (mg)		
Calcium (mg)		

[**Note:** Energy requirements for elderly change after 60 years. For instance, the energy needs of a 65 year old women (reference weight 50 kg) would be 1704 Kcals].

### Step III : Select the food exchanges

Keeping in mind the various mineral and electrolyte imbalance which frequently develop during CRF apart from uremia; carefully select appropriate food exchanges to meet the nutritional requirements of the patients. You may need to once again read the food sources for some important nutrients such as protein, sodium, potassium, phosphorus and calcium.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
S. Milk					
Meat					
Pulse					
Cereal					
Starches Root/Tubers					
Other Vegetable					
Leafy Vegetable					
Fruit					
Sugar					
Fat (oil)					

#### Step IV : Distribute the food exchanges

**Note:** The above selected exchanges need to be distributed judiciously through out the day depending upon the meal pattern most suitable for the patient. Since Mrs. Darshan is experiencing severe gastrointestinal disturbances and shortness of breath; it would be essential to give small frequent easy to digest meals through out the day. Write the exchanges in the format given herewith.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	After Dinner
S. Milk								
Meat								
Pulse								
Cereal								
Starches Root/Tubers								
Other Vegetables								
Leafy Vegetables								
Fruit								
Sugar								
Fat								

#### Step V : Plan a day's menu for Mrs. Darshan

Prepare a day's menu most suitable to the clinical conditions of Mrs. Darshan. Select the dishes as per the exchanges available for each meal in Step IV above.

##### Sample Menu for Mrs. Darshan

Early Morning	Breakfast	Lunch	Evening Tea	Dinner	After Dinner



### Conclusion

Now, compare the amount of computed nutrient with the modified RDI.

<b>Nutrient</b>	<b>Computed Amount through Diet Plan</b>	<b>Amount as per the Modified RDI</b>	<b>± % of Difference</b>	<b>Suggestions for Improvement</b>
Energy				
Protein				
Sodium				
Potassium				
Calcium				
Iron				

Submit the activity for evaluation.

---

Counselor's Signature

**DIET PLAN FOR ACUTE RENAL FAILURE**

**Aim** : To plan a diet for a patient suffering from acute renal failure.

Date :

**Case Study** : Mrs. Kiran is a 47 years old office executive (weight 51.5 kgs) who had suffered from severe blood loss following a limb surgery. Thereafter she went into a state of shock and her urine output reduced suddenly to 40 ml/ 24 hrs. Her vital clinical parameters include: BUN = 42 mg/100 ml, Serum creatinine = 7.8 mg/ 100 ml, sodium (serum) = 14.3 mEq/L, Hypotension (100/61 mmhg), Haemoglobin = 5.8%.

At present she is on blood transfusion and her urine output has increased to 218 ml/ 24 hrs. If her condition does not improve in the subsequent 48 hrs., she shall be put on haemodialysis. Plan a day's diet for her for today (i.e. prior to dialysis) based on the above mentioned clinical parameters.

**Introduction**

(In the space provided herewith describe the disease condition affecting Kiran).

**Step I : Patient's Profile**

Now, read the case carefully and fill the patient profile in the format given below:

***Patient/Case Profile***

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

### Step II: Assess the nutrient requirement of Mrs. Kiran

Read the case carefully to identify whether the patient is oliguric/diuretic phase. Although the urine output has increased; Mrs. Kiran is still suffering from oliguria and uremia. She is presently not on dialysis.

Based upon your understanding of the disease condition and the patient's profile, assess/calculate the nutritional needs of Mrs. Darshan and compare them with the RDI for a healthy adult sedentary woman (Refer to Table 1.1 in Practical 1).

#### Recommended Dietary Intake

Nutrients	Normal	Modified
Energy (Kcal)		
Protein (g)		
Sodium (mg)		
Potassium (mg)		
Fluids (ml)		

*Calculations:*

### Step III: Select the food exchanges

Based Upon the modified RDI, select the food exchanges and write in the format given herewith.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk					
Meat					
Pulse (Optional)					
Cereal					
Starches Root/Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Sugar					
Fat					
<b>Total</b>					

**Step IV : Distribute the exchanges**

Distribute the above selected exchanges according to the meal pattern (6-7 meals/day) most suitable for the patient (anorexia, vomiting, impaired digestion/absorption).

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Tea	Dinner	After Dinner
Milk								
Meat								
Pulse (optional)								
Cereal								
Starches Roots/Tubers								
Other Vegetables								
Leafy Vegetables								
Fruit								
Sugar								
Fat								

**Step V : Plan a day's menu**

Using the exchanges available for each meal, prepare a menu by selecting the food-stuffs most appropriate for Mrs. Kiran's nutritional needs.

**Sample menu for Mrs Kiran**

Early Morning	Breakfast	Mid Morning	Lunch	Tea	Dinner	After Dinner

**Step VI: Detailed menu plan**

Select appropriate quantities for each dish as per the exchanges available and calculate the following nutrient content for the detailed diet plan.

<b>Meal</b>	<b>Menu</b>	<b>Ingredients</b>	<b>Amt. (g)</b>	<b>Exchange</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>K (mg)</b>	<b>Na (mg)</b>	<b>Fluids (mg)</b>
<b>Total</b>									



## Conclusion

Now, compare the amount of computed nutrient with the modified RDI.

<b>Nutrient</b>	<b>Computed Amount through Diet Plan</b>	<b>Amount as per the Modified RDI</b>	<b>± % of Difference</b>	<b>Suggestions for Improvement</b>
Energy (Kcal)				
Protein (g)				
Sodium (mg)				
Potassium (mg)				
Fluid (ml)				

Also give examples of the following feeds which can be given to a patient suffering from acute renal failure.

**Total Parenteral Nutrition**

**Enteral Feeds**

**Submit the activity for evaluation.**

---

**Counselor's Signature**

## ACTIVITY

# 5

## DIET PLAN FOR HEMODIALYSIS

Date :

**Aim** : To plan a diet for a patient undergoing regular dialysis.

**Case Study** : Mr. Harish is a 55 years old man who was admitted to the ICU of renal ward for the third time. Patient's renal profile has been altered from last two years and he was on medication. Now, patient is suffering from anuria (Nil urine output) from last one day. Nephrologist has advised the patient to undergo hemodialysis. Mr. Harish is having history of hypertension and diabetes and was on antihypertensive and hypoglycemic drugs. Some of his clinical parameters are:

Glomerular filtration rate	:	15 ml/min
Hemoglobin	:	8.9 mg/dl
Urea	:	78 mg/dl
Creatinine	:	3.2 mb/dl
Serum sodium	:	151 mmol/l
Serum Potassium	:	4.9 mmol/l
Albumin	:	2.6 g/dl
Blood Pressure	:	140/90 mg Hg
Random Blood Glucose	:	200 mg/dl
Urine output in previous 24 hrs.	:	Nil

His medical reports have been forwarded to the dietitian to help the patient with dietary counselling during dialysis. Patient's weight is 68 kgs and height is 5'7". Plan a diet for Mr. Harish.

Start the exercise with introduction.

### Introduction

(Describe the clinical condition which the patient is suffering from. Write the objectives of dietary management and nutritional therapy for hemodialysis in the space provided herewith).

### Step I : Patient's Profile

Now, read the case carefully and fill the patient profile in the format given below:

#### *Patient/Case Profile*

Name:

Age:

Gender:

Activity:

Dietary habits:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

Next, compare the patient's clinical parameters with the normal values/standard values. (Refer to Table 16.1, Unit 16 in MFN-005 theory course for standard values).

Patient Value	Normal Values/range
Glomerular filtration rate	
Serum potassium	
Systolic blood pressure	
Diastolic blood pressure:	
Serum sodium	
Serum creatinine	
Blood Urea Nitrogen	
Serum Albumin	

### Step II: Assess the nutrient requirement of Mr. Harish

Based upon your understanding of the disease condition and the patient's profile, assess/calculate the nutritional needs of Mr. Harish and compare them with the RDI for a sedentary elderly man.

#### Recommended Dietary Intake

Nutrient	Normal	Modified
Energy (Kcal)		
Protein (g)		
Sodium (mg)		
Potassium (mg)		
Iron (mg)		
Calcium (mg)		

[**Note:** Energy requirements for elderly change after 60 years. For instance, the energy needs of a 65 year old women (reference weight 50 kg) would be 1704 Kcals].

### Step III : Select the food exchanges

Keeping in mind the various mineral and electrolyte imbalance which frequently develop during ESRD apart from uremia; carefully select appropriate food exchanges to meet the nutritional requirements of the patients. You may need to once again read the food sources for some important nutrients such as protein, sodium, potassium, phosphorus and calcium.

Exchange	No.	Energy (Kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
S. Milk					
Meat					
Pulse					
Cereal					
Starches Root/Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Sugar					
Fat (oil)					

#### Step IV : Distribute the food exchanges

**Note:** The above selected exchanges need to be distributed judiciously through out the day depending upon the meal pattern most suitable for the patient. Since Mr. Harish is experiencing severe gastrointestinal disturbances and shortness of breath; it would be essential to give small frequent easy to digest meals through out the day. Write the exchanges in the format given herewith.

Exchange	No.	Early Morning	Break-fast	Mid Morning	Lunch	Evening Tea	Dinner	After Dinner
S. Milk								
Meat								
Pulse								
Cereal								
Starches Root/Tubers								
Other Vegetables								
Leafy Vegetables								
Fruit								
Sugar								
Fat								

#### Step V : Plan a day's menu for Mr. Harish

Prepare a day's menu most suitable to the clinical conditions of Mr. Harish. Select the dishes as per the exchanges available for each meal in Step IV above.

##### Sample Menu for Mr. Harish

Early Morning	Breakfast	Lunch	Evening Tea	Dinner	After Dinner



### Conclusion

Now, compare the amount of computed nutrient with the modified RDI.

<b>Nutrient</b>	<b>Computed Amount through Diet Plan</b>	<b>Amount as per the Modified RDI</b>	<b><math>\pm</math> % of Difference</b>	<b>Suggestions for Improvement</b>
Energy				
Protein				
Sodium				
Potassium				
Calcium				
Iron				

**Submit the activity for evaluation.**

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**Counselor's Signature**

## DIET PLAN FOR NEPHROLITHIASIS

**Aim** : To plan a diet for a patient suffering from kidney stones.

Date :

**Case Study** : Mr. Swaran is a 50 years old chef. His height is 5'6" and is slightly overweight. Of late he has been experiencing discomfort during urination. His urine analysis indicated a high solute content (particularly of calcium), traces of blood and slightly alkaline pH (7.4). He has a positive family history of renal stones and had suffered from calcium oxalate stones around 8 years back. He is slightly hypertensive (145/ 42 mm Hg) and is a borderline case of hypercholesterolemia. Plan a diet for Mr. Swaran.

**Introduction**

(Describe Mr. Swaran's disease condition in the space provided herewith).

**Step I: Patient's Profile**

Now, read the case carefully and fill the patient profile in the format given below.

*Patient Profile/Case Details*

Name:

Age:

Gender:

Activity:

Socio-economic status:

Pathophysiological stress:

Diet prescribed:

**Note:** Points that may help you in planning the diet.

- Low calcium diet (< 400 mg/day) helps in reducing hypercalcuria.
- Low oxalate (<10 mg/100 g edible portion) food stuffs should be preferred.
- Protein restriction (0.8 m/kg/day) has been found to be associated with reduced excretion of calcium and oxalate.
- It may be important to modify the quality of fat (marine foods are helpful as they contain EPA).
- A low sodium diet is suggested for calcium oxalate and hypertensive patients.
- Fluid intake should be increased to atleast 3.0-3.5 lit/day.

**Step II : Assess nutrient requirement**

Assess/calculate the nutrient needs and compare them with the RDI of a healthy adult man.

**Recommended Dietary Intake**

Nutrients	Normal	Modified
Energy (Kcal)		
Protein (g)		
Sodium (mg)		
Calcium (mg)		
Fluids (ml)		

**Step III : Select the food exchanges**

Based upon the modified RDI, select the food exchanges.

Exchange	No.	Energy (Kcal)	Protein (g)	CHO(g)	Fat(g)
S. Milk					
Meat					
Pulse					
Cereal					
Roots/Tubers					
Other Vegetables					
Leafy Vegetables					
Fruit					
Sugar					
Fat (oil)					
<b>Total</b>					

**Step V : Distribute the selected exchanges**

Distribute the above selected exchanges according to the meal pattern (6-7 meals/ day) most suitable for the patient .

Exchange	No.	Early Morning	Breakfast	Lunch	Tea	Dinner
S. Milk						
Meat						
Pulse						
Cereal						
Root/Tubers						
Other Vegetables						
Leafy Vegetables						
Fruit						
Sugar						
Fat (oil)						



**StepV : Plan a day’s menu for Mr. Swaran**

Keeping in mind the exchanges available for each meal, prepare a menu for Mr. Swaran by selecting the food stuffs most appropriate for his condition.

**Sample menu for Mr. Swaran**

<b>Early Morning</b>	<b>Breakfast</b>	<b>Lunch</b>	<b>Tea</b>	<b>Dinner</b>

**Note:**

- Table/cooking salt should not be added .
- Since the patient is borderline hypercholesterolemic; a commercial source of fibre (guar-gum, psyllium husk, neem bark powder etc.) may be added to meals as several high fibre foods (whole pulses, whole cereals ) are also good sources of calcium which need to be avoided.



### Conclusion

Now, compare the amount of computed nutrient with the modified RDI.

<b>Nutrient</b>	<b>Computed Amount through Diet Plan</b>	<b>Amount as per the Modified RDI</b>	<b>± % of Difference</b>	<b>Suggestions for Improvement</b>
Energy (Kcal)				
Protein (g)				
Sodium (mg)				
Calcium (mg)				
Fluid (ml)				



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**Submit the activity for evaluation.**

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**Counselor's Signature**

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# PRACTICAL 9    NUTRITIONAL MANAGEMENT OF CORONARY HEART DISEASES

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## Structure

- 9.1 Introduction
- 9.2 Coronary Heart Disease: An Overview
- 9.3 Hypertension
- 9.4 Atherosclerosis
- 9.5 Myocardial Infarction
- 9.6 Congestive Heart Failure
- 9.7 Review Exercises

*Activity 1:* Diet Plan for Hypertension

*Activity 2:* Diet Plan for Acute MI and Hypercholesterolemia

*Activity 3:* Diet Plan for Congestive Heart Failure

---

## 9.1 INTRODUCTION

---

Coronary heart diseases are a group of diseases of the heart. You may recall studying about the coronary heart diseases in Unit 11 in the theory course (MFN-005). Some of the common ones that we shall review in this practical are:

- Hypertension
- Atherosclerosis
- Myocardial infarction
- Congestive heart failure

These coronary diseases are of prime importance as we see that the incidence of these diseases is rising at an enormous rate and they account for an appreciable proportion of mortality and morbidity in the populations groups. The main focus in this practical will be on the dietary guidelines and principles involved in planning diets for these heart conditions.

### Objectives

After undertaking this practical you will be able to:

- discuss different types of coronary heart diseases, their etiologies,
- describe established risk factors of coronary heart diseases,
- gain insight into the dietary management goals and modify diets according to the guidelines, and
- plan diet for patients suffering from hypertension, myocardial infarction and congestive heart failure.

## 9.2 CORONARY HEART DISEASE: AN OVERVIEW

Coronary heart disease is a leading cause of death in the general population, affecting the majority of adults past the age of 60 years. Men are more likely to develop and to do so at an earlier age than women.

Established multiple risk factors in coronary heart disease are -

- a. *Non-modifiable risk factors*, which are the *personal characteristics* such as sex, age and family history.
- b. *Modifiable risk factors*, which are *behavioural* (such as smoking and sedentary life-styles, food habits) (like excessive fat, excessive sugar, excessive salt etc.) *physiological* (such as hyperlipidemia, obesity, diabetes mellitus etc.) and *psychological* (such as stress).

Though we have already studied about the etiological risk factors and pathophysiology of coronary heart diseases in detail earlier in the theory course, here in this practical we will once again recapitulate some of the important coronary diseases, with the main focus on the principles of dietary management. You may recall studying in section 11.4 in the theory course (MFN-005) about the preventive measures for coronary heart diseases. WHO recommended nutrition guidelines for prevention of heart disease include:

- Sufficient calories to maintain appropriate weight for a given height
- Total fat between 20-30% of total calories
- Cholesterol not to exceed 300 mg/day
- Saturated fats less than 10% of total calories
- Polyunsaturated fats less than 8% of total calories
- Linoleic acid between 3-7% of total calories
- Alpha linolenic acid less than 1% of total calories
- Proteins to provide 15-20% of total calories

Mentioned in Table 9.1 are details regarding nutrient intake and food choice checklists that can be used as effective tools for modifying the dietary intake of the masses at large as recommended by WHO.

**Table 9.1 : Dietary recommendations for the prevention of Coronary Heart Disease (WHO)**

Calories	: Sufficient to maintain ideal body weight
Total fat	: 20-30% of calories
Cholesterol	: < 300 mg/day
SFA	: < 10% of total calories
PUFA	: < 8% of total calories
P/S ratio	: 0.8-1.0
Linoleic acid (LA/n-6)	: 3-7% of total calories
Alpha linolenic acid (ALNA/n-3)	: < 1 % of total calories
LA/ALNA ratio	: 5-10
Proteins	: 15-20% of total calories
Carbohydrates	: 55-65% en with emphasis on complex carbohydrates
Sugars	: < 10% of total calories
Salt	: 5-7 g/day
Dietary fibre	: 40 g/day

Keeping these recommendations in mind, let us now take up specific coronary heart disease conditions and study about their dietary management, in particular.

We begin our review with hypertension.

### 9.3 HYPERTENSION

Hypertension is usually defined as a blood pressure of 130/80 or greater. Normal blood pressure is 120/80 or less. A systolic blood pressure of 120-129 and a diastolic blood pressure of <80 is considered elevated blood pressure. Table 9.2 presents the classification given by American Centre for Cardiology/ American Heart Association (ACC/AHA), 2017 on Hypertension.

**Table 9.2: Classification of blood pressures and stages of hypertension in adults**

Blood Pressure Range SBP/DBP	Classification
120/80	Normal (optimal)
120-129/<80	Elevated
130-139/80-89	Hypertension (Stage I)
≥ 140/≥ 90	Hypertension (Stage II)
≥ 180/≥ 120	Hypertensive Crisis

Source: ACC/AHA, 2017.

As for the causative factors, 90% of the times the etiology of hypertension is not known. High blood pressure in the absence of any underlying disease is called *primary hypertension*. Elevated blood pressure due to some underlying disease is *secondary hypertension*. Increase in blood volume, heart rate and peripheral vascular resistance can lead to hypertension. Being overweight, excessive intake of salt and lack of physical exercise can all contribute to increase in BP.

Next, let us review the treatment and management of hypertension, with a focus on nutritional management. We begin with the objectives of nutritional management.

#### **Objectives of nutritional management**

The objective of nutritional management of hypertension includes:

- to achieve gradual weight loss in overweight and obese individuals and maintain weight slightly below the normal levels,
- to reduce sodium intake and maintain fluid and electrolyte balance,
- to maintain adequate nutrition,
- to lead a healthy lifestyle (no smoking, high physical activity), and
- to retard the onset of complications.

In order to meet the above objectives, we need to understand the nutrient requirements and modification required in the diet during hypertension. These are enumerated next.

### *Modifications in diet and Recommended dietary allowances*

- Choosing foods low in calories and fat. Calorie requirement is based on the concept of maintaining ideal body weight. Protein should contribute 15-20% of the total energy need. The fats incorporated in the diet should be rich in unsaturated fatty acids and should not provide more than 20% of the total energy.
- Choosing foods that are low in sodium (salt).
  - Mild sodium restriction means 2-3 grams of salt/day.
  - Moderate sodium restriction means 1 gm salt/day.
  - Strict restriction means 0.5 grams a day of salt.

(Refer to Table 11.6 in Unit 11 and Table 16.2 in Unit 16 in theory course for sodium content of some food items).

- Choosing foods high in fiber. About 60-65% energy should be provided from carbohydrates which are polysaccharides (complex carbohydrates) rather than simple sugars (monosaccharides and disaccharides).
- Maintaining a healthy weight or losing weight, if overweight.
- Limiting serving sizes.
- Increasing physical activity as it redistributes body water and eases transit of blood through peripheral arteries.
- Practicing moderation if consuming alcoholic beverages. In moderation alcohol relaxes the peripheral arteries and so reduces blood pressure but high doses clearly increases BP. Moderation means no more than one drink for women and two drinks per day for men.
- Adequate amounts of calcium, magnesium, potassium and vitamin C is also necessary as the deficiency may lead the walls of the arteries to constrict causing hypertension.
- It has been proposed that fish oil supplements may have a variety of protective cardiovascular effects, including a reduction in systemic blood pressure (BP). Fish intake in combination with weight loss may have additive effects on blood pressure reduction in hypertensive patients

Next, let us review the pathophysiology and the dietary management of atherosclerosis.

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## **9.4 ATHEROSCLEROSIS**

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Atherosclerosis, you may recall studying, in sub-section 11.3.2 in Unit 11 in the Theory Course (MFN-005), is a disease affecting arterial blood vessels. It is an arterial lesion characterized by patchy thickening of the intima comprising of fat and layers of collagen like fibres.

It is unknown exactly how atherosclerosis begins or what causes it. There is a gradual build-up of plaque or thickening of the inside of the walls of the artery, causing a decrease in the amount of blood flow, and a decrease in the oxygen supply to the vital body organs and extremities. A *heart attack* may occur if the oxygenated blood supply is reduced to the heart. A *stroke* may occur if the oxygenated blood supply is cut off to the brain. *Gangrene* may occur if the oxygenated blood supply is reduced to the arms and legs.

Atherosclerosis has been associated with the following risk factors such as elevated cholesterol and triglyceride levels, high blood pressure, smoking, diabetes mellitus, obesity, physical inactivity and older age.

Next, let us learn about the nutritional management goals of this disorder.

### ***Nutritional management goals***

The nutritional management goals of atherosclerosis include:

- Reduction of weight if overweight or obese.
- Reduction in total fat, saturated fat and cholesterol.
- Consuming a balanced adequate diet, rich in calcium, chromium, iron and zinc.
- Medication if required for treating lipid disorders and controlling BP.
- Lifestyle changes - increase in physical exercise, moderation in alcohol intake. No smoking, restricting coffee.
- Medical management is through various lipid lowering drugs.

Dietary modifications and the nutrient requirements for this condition are enumerated next.

### ***Modifications in diet and Recommended dietary allowances***

- Calories: to maintain ideal body weight
- Carbohydrates should constitute 55-65% of calories with emphasis on polysaccharides (complex carbohydrates)
- Sugar less than 10% of total calories
- Dietary fibre : >40 g/day
- Proteins: 15-20% of modified energy
- Fat: 20% of total energy
- Dietary cholesterol: < 200-300 mg/day

Some *other considerations* include:

- *Saturated fatty acids* (SFA) – SFA intake is associated with hypercholesterolemia and atherosclerosis in humans. Some dietary SFAs like palmitic, myristic (most potent) and lauric acids have the most hypercholesterolemic effects as they elevate LDL-c. They are found in butterfat, coconut and palm kernel oils. Saturated fat must constitute no more than 10% of calories.
- *Poly unsaturated fatty acids* (PUFAs) – PUFAs are known to lower total serum cholesterol; especially the n-6 series is more beneficial. n-3 series also have positive effects by reduction of platelet aggregation, as well as, favourable changes on blood lipids and blood pressure. n-6 PUFA is found in corn, sunflower, safflower and soybean oils. Sources of linolenic acid (n-3) include wheat, bajra, Black gram, cowpea, rajmah, soyabean, green leafy vegetables, fenugreek and mustard seeds (spices) apart from fish. Linolenic acid can also be obtained from oils like mustard, soyabean, canola and rice bran oil. ICMR (1998) has given dietary guidelines to maintain *n-6/n-3 ratio of 5-10* and *PUFA/SFA of 0.8-1.0* which ensures long-term health. Hence, the choice of cooking oil should be:

a) Moderate linoleic acid oils (n-6) like groundnut oil, rice bran oil or sesame oil

OR

Soyabean oil [containing both linoleic and alpha linolenic acid (n-3)], and

b) *Combination of two oils* in approximately equal proportion:

Use high linoleic acid oils like sunflower oil, safflower oil and cottonseed oil with palm oil (low linoleic acid)

OR

Mustard oil (containing alpha-linolenic acid) along with any other cooking oil (this will reduce erucic acid from mustard oil and thereby its undesirable health effects)



- Include *monounsaturated fatty acids*. Its sources are olive oil, canola oil, groundnut oil, rice bran oil, red palm oil and sesame oil.
- *Trans fatty acids* : Trans fatty acids raise blood cholesterol levels, increasing the risk of CVD though to a lesser degree than the saturated fatty acids. Patients are recommended to restrict their trans fatty acid such as margarine, shortenings, partially dehydrogenated oils, vanaspati ghee, cookies, crackers and fried foods.
- *Dietary cholesterol* : Dietary cholesterol raises total cholesterol and LDL cholesterol. It is found in animal foods such as meat, fish and poultry. Egg yolks and organ meats are particularly rich sources. Limited intake of cholesterol i.e. < 200 - 300 mg/d is recommended.
- *Dietary fiber* : Soluble fiber sources include oats, legumes, fruit pectin etc. Soluble fiber lowers serum cholesterol and LDL cholesterol, promotes insulin sensitivity, increase satiety, promote lower energy intake, thus causing lower incidence of CHD. Total fiber should be 40g/ 2000 kcal for adults, 25% of which should be soluble. Two mechanisms are known for soluble fiber - (1) fiber binds bile acids, which lowers serum cholesterol to replete the bile acid pool, and (2) bacteria in the colon ferment the fiber to compound acetate, propionate and butyrate which inhibits cholesterol synthesis.
- *Soy proteins* : Soy have been found to decrease total cholesterol, LDL and triglyceride without lowering HDL-c levels. Approximately, 50 g/d of soy protein may be replaced with animal protein to achieve the cholesterol lowering effect. The phytosterol and phytoestrogen content of soy protein also plays role in this lowering. It may be found in tofu, soy milk, soy protein supplemented drinks etc.
- *Alcohol* : When its intake is in excess, alcohol is related to cause adverse affects causing liver damage and cirrhosis, cardiomyopathy and elevated blood pressure. Moderate intake is related to lowering incidence of CHD in some populations. Alcohol raises HDL cholesterol; wine contains an antifungal compound that increases HDL cholesterol and inhibits LDL oxidation.

With these considerations, we end our study on atherosclerosis. Next, we shall review myocardial infarction.

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## 9.5 MYOCARDIAL INFARCTION

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Acute myocardial infarction (AMI or MI), commonly known as a heart attack, is a serious, sudden heart condition usually characterized by varying degrees of chest pain or discomfort, weakness, sweating, nausea, vomiting and arrhythmias, sometimes causing loss of consciousness.

The medical term *myocardial infarction* derives from *myocardium* (the heart muscle) and *infarction* (tissue death), in this case caused by an obstruction of blood flow. It occurs when a part of the heart muscle is injured, and this part may die because of sudden total interruption of blood flow to the area. It is often a life-threatening medical emergency which demands immediate attention.

The nutrient requirements and the overall dietary management of MI patient is reviewed next. We begin our study by highlighting the objectives of dietary management of MI.

### ***Objectives of dietary management***

The objectives of dietary management of myocardial infarction patient are as follows:

- to provide rest to the injured heart,
- to maintain an optimum nutritional status,
- to achieve and maintain a desirable body weight, and

- to prevent the development of another attack of MI and /or congestive heart failure.

For meeting the above objectives the dietary modifications and the nutrient requirement recommended are detailed next.

#### *Modifications in diet and Recommended dietary allowances*

Long term diet therapy is implemented when the patient is out of immediate medical danger. Diet is tailored to meet individual needs and deal with conditions such as hyperlipidemia, hypertension, obesity and diabetes. The important aspects to be considered include:

- 1) A low calorie diet (1200-1500) is used to avoid the metabolic stress caused by larger intakes and to begin promoting weight loss. The energy intake may initially begin with 800 Kcal which can be slowly progressed to a 1200 Kcal diet till the patient is discharged. Thereafter, the patient's energy intake should be governed on the maintenance of body weight which is preferably 1 to 2 kg below ideal body weight.
- 2) Large meals are avoided (more than 600-700 Kcal) because they increase heart rate and stroke volume. Recommend the patient to adhere to small frequent meal pattern.
- 3) Majority of MI patients are also hyperlipidemic and have elevated serum triglyceride levels. In such cases, the calorie contribution from fat should not be above 20% and the dietary cholesterol intake should remain below 200 mg per day. Recommend reducing saturated fat intake by substituting skimmed or 1 per cent milk for whole milk, and by replacing animal products with those of vegetable origin as much as possible.
- 4) Carbohydrates should provide 60% of the total energy. However, emphasis should be laid on the inclusion of easy-to-digest simple carbohydrates, which are low in fibre. Low fibre cereals, roots and tubers should be served in a soft, well cooked/blended form (purees etc.).
- 5) A moderate sodium restriction (2-3 gms/day) to control tendency of oedema and congestive heart failure to develop.
- 6) When fats are needed for cooking, spreads, and other uses, recommend oils with high amounts of monounsaturated and/or polyunsaturated fatty acids, especially n-3 polyunsaturated fats such as canola, olive oils and soybean oil.

After a brief review of measures specific to myocardial infarction, we finally take a look at the congestive heart disease condition.

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## **9.6 CONGESTIVE HEART FAILURE (CHF)**

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CHF is a syndrome in which heart can no longer adequately pump blood through the circulatory system. It is also called *chronic heart failure*.

CHF results from decreased myocardial efficiency, it can be caused by an MI, valve disease, thiamin deficiency and other conditions. Renal blood flow may decrease with impaired excretion of sodium and water. Peripheral and pulmonary oedema with ascites often results.

Nutritional care is a little difficult in congestive heart failure, since oedema complicates the nutritional assessment of the subject. Nevertheless, the objectives of dietary management are enumerated herewith.

### ***Objectives of dietary management***

The objectives of dietary management of congestive heart disease include:

- to minimize stress workload on the heart,
- to correct and maintain fluid and electrolyte imbalance,
- to maintain a desirable body weight, and
- to maintain an optimum nutritional status.

Dietary goals in CHF are to increase energy intake because organ systems – heart and lungs – must work extra hard to maintain their functions. Blood flow and nutrient supply is affected and weight loss usually goes unnoticed due to anorexia and altered taste. Thus CHF patients are subjected to protein-calorie malnutrition. Chronic PEM which develops due to heart failure is called *cardiac cachexia*. Keeping the above objectives in mind, let us review the nutrient requirements and the dietary modifications required for the dietary management of this condition.

### ***Modifications in diet and Recommended dietary allowances***

To ensure proper nutrition, therefore the dietary guidelines include:

- 1) Patients on artificial oxygen support systems and/or those who are obese are recommended 1200 Kcal diet. Ambulatory and /or normal weight patients are usually able to tolerate around 20-25 Kcal/kg IBW per day. Providing adequate calories is vital but providing too much may increase the metabolic stress on the body taxing the heart.
- 2) About 1g of protein per kg ideal body weight should be incorporated in the diet. Since CHF is a form of cardiomyopathy and there is weakness of cardiac muscles, it is essential to supply good amounts of dietary proteins particularly high biological value proteins to facilitate tissue synthesis.
- 3) Fats should not provide more than 20% of the total energy and the diet should be low in cholesterol (< 200 mg/day) depending upon the lipid profile of the patient.
- 4) Mild to moderate sodium restriction (2.0 -3.0 g Na per day) is often beneficial for most patients. Restriction of table salt and cooking salt is recommended for all patients. High sodium fruits and vegetables such as fenugreek leaves, lettuce, spinach, beetroot, tomato, grapes, musk melon, as well as, processed foods and preserves should be avoided.
- 5) Dietary fiber is carefully adjusted. Goal is to provide more of soluble fiber than insoluble fiber to avoid constipation and to prevent gas production.
- 6) For clients who are unable to eat, calorie and nutrient dense formulas are given which have less water and can prevent PEM.
- 7) Fluid intake should be reduced to reduce the circulatory volume. It can range from 1-1.5 lit/day.

Few other considerations are highlighted next.

### ***Other considerations***

- Subjects with congestive cardiac failure often tolerate frequent meals better than larger infrequent meals as these are tiring to consume, can contribute to abdominal distention and markedly increase oxygen consumption.

- Alternative seasonings and flavouring agents such as mild herbs and condiments may be used sparingly if sodium restriction is moderate to severe in order to ensure adequate food intake.
- The menu should be planned by keeping in mind the fluid allowance for the day.
- The patient should be advised to chew the food slowly. Sweating and chest discomfort are indicators of oxygen deficiency. Food ingestion should be stopped in such situations.
- Meals should be soft and well cooked. Raw food should be completely avoided.
- If the patient is on ventilator, oral intake may not be feasible. In such situations; enteral tube feeding should be started.

With these considerations, we end our study of congestive heart failure. We hope the discussion above may have given you a good insight into the coronary heart diseases and their dietary management. Let us then review what we have learnt so far by answering the review exercises given next. After completing these exercises, we can move on to planning diets for the disease conditions included in this practical. There are three activities given in this practical. Undertaking these activities will help you apply the knowledge you have gained so far in planning diets for patients suffering from hypertension, atherosclerosis, myocardial infarction and congestive heart failure. So get started.

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## **9.7 REVIEW EXERCISES**

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1) What is coronary heart disease?

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2) What diet modification would you recommend for a patient with increased cholesterol levels?

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3) Give three sources of SFA, MUFA and PUFA each.

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4) What are n-3 and n-6 fatty acids? What is the healthy ratio in the RDA as per ICMR guidelines?

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5) What is the reason to put a post-MI patient on a low calorie diet?

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6) What is cardiac cachexia in CHF? Explain why CHF patients are prone to protein malnutrition.

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.....

Now, let us get started with the activities.



# ACTIVITY

# 1

## DIET PLAN FOR HYPERTENSION

Date :

**Aim** : To plan a diet for a hypertensive patient

**Case study** : Mr Verma is a 50 yr old high school cricket coach. He is 80 kgs with a height of 5'5" and smokes one pack of cigarettes a day. He is admitted for further evaluation and for his essential hypertension. His BP on admission is - 150/90

Chief complaint- "I have tried to cut down on my salt but food just doesn't taste good without it. ...I want to control my hypertension – my mother just passed away because of a heart attack.."

Patient history- He has a strong family history of heart disease. He was given a diet sheet of 2 gram salt diet (no added salt) since he was detected with hypertension but he has not been able to eat properly since then as the food doesn't taste good anymore which discourages him to stick to the low salt diet and encourages him to skip his meals or overindulge.

His wife is also working, so on an average, they eat out 2-3 times a week.

His doctor has prescribed some antihypertensive medications and wants him to see a dietitian for a diet plan and low salt food list.

Based on the case study presented above, plan a diet following the instructions given herewith. Start the activity with a brief introduction on the disease condition.

### Introduction

(Describe briefly Mr. Verma's disease condition in the space provided herewith).

### Step I : Patient's Profile

(Read the case study carefully and identify the important points that may determine nutrient intake/diet planning. Identify specific disease characteristics. Based on the risk factors, comment on the patient's profile).

#### *Patient/Case Profile*

*Age:*

*Smoking habit:*

*Gender:*

*Drinking habit:*

*Family history of heart disease: Yes/No*

*Activity pattern:*

*Weight:*

*Usual BP:*

**Step II: Assessment of the nutritional needs of the patient.**

(In the format given herewith, present the recommended dietary intake for Mr. Verma. Work out your calculations for reaching the modified RDI and record those in the space provided herewith. Compare his requirement with the requirement of a sedentary healthy male). Refer to Table 1.1 in Practical 1.

**Recommended Dietary Intake for 24 hours**

Nutrients	Normal RDA for Sedentary Male	Modified RDA for Mr. Verma
Calories (Kcal)		
Total fat		
Cholesterol		
SFA		
PUFA		
Proteins (g)		
Carbohydrates (g)		
Salt (mg)		
Dietary fiber		

**Calculations:**

*List 3 main nutritional considerations/goals for this patient.*

**Step III: Based upon the modified RDI, now select exchanges for each food group.**

(Plan a food exchange plan for Mr. Verma. Record the exchanges in the format given herewith).

Exchanges	No.	Calories (Kcal)	Carbohydrates (g)	Proteins (g)	Fat (g)
Milk					
Cereals					
Roots/Tubers					
Pulses					
Meat					
Green Leafy Vegetables					
Other Vegetables					
Fruits					
Sugar					
Fat					
<b>Total</b>					

**Step IV: Distribute the above selected exchanges according to the meal pattern most suitable for the patient.**

Exchange	No.	Early Morning	Break-fast	Lunch	Evening Tea	Dinner
Milk						
Cereals						
Roots/Tubers						
Pulses						
Meat						
Veg. A						
Veg. B						
Fruits						
Sugar						
Fat						
<b>Total</b>						

**Step V: Using the exchange available for each meal prepare a menu for Mr. Verma by selecting the most appropriate foodstuffs (nutritional needs of the patient).**

**Menu for Mr. Verma**

Early Morning	Breakfast	Lunch	Evening Tea	Dinner



**Step VI: Detailed meal plan**

Select appropriate quantities for each dish as per the exchanges available and calculate the nutrient content for the detailed diet plan as per the format given herewith.

<b>Meal</b>	<b>Menu</b>	<b>Ingredient</b>	<b>Amt. (g)</b>	<b>Exchange</b>	<b>Energy (Kcal)</b>	<b>Protein (g)</b>	<b>Sodium (mg)</b>	<b>Dietary Fibre</b>
<b>Total</b>								

### Conclusion

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

Nutrient	Computed Amount through Diet Plan	Amount as per the Modified RDI	$\pm$ % of Difference	Suggestions for Improvement
Energy (Kcal)				
Protein (g)				
Sodium (mg)				
Fibre (mg)				

What dietary counseling would you give to Mr. Verma regarding foods to be avoided and allowed? Write in the format given herewith.

Foods to be Avoided	Foods Allowed

Identify 5 foods using the 'Nutritive Value of Indian Foods' book which are low in sodium, moderate in sodium and high in sodium content.

Submit the activity for evaluation.

\_\_\_\_\_  
Counselor's Signature

## DIET PLAN FOR ACUTE MYOCARDIAL INFARCTION AND HYPERCHOLESTEROLEMIA

**Aim** : To plan a diet for a patient with acute MI and hypercholesterolemia

Date :

**Case study** : Mr. Khanna is a 61 year old male who was admitted to the emergency ward because of sudden onset of a pressure like pain radiating to the jaw and left arm. He also noted an episode of vomiting and nausea. He admits to smoking 1 pack of cigarette for last 40 years. He has past history of hypertension and increased cholesterol levels. His height is 5'10" and weighs 82 kgs.

Treatment plan: Angioplasty of distal right coronary artery and stenting was done to limit infarcted area. His lipid profile is as under:

### **Lipid Profile:**

Mr. Khanna's levels (mg%)

HDL-C	:	30
VLDL-C	:	45
LDL-C	:	160
LDL/HDL	:	5.3
TG	:	150
Cholesterol	:	220

Patient is now admitted at the rehabilitation center and doctor has called a dietitian to plan a diet for him as he is ready for discharge.

Based on the case study, now plan a diet for Mr. Khanna. Follow the instructions given herewith.

### **Introduction**

(Describe briefly Mr. Khanna's disease condition in the space provided herewith).

**Step I :** Identify specific disease characteristics. Based on the risk factors, comment on the patient's profile.

***Patient/Case Profile***

Age: Smoking habit:  
 Gender: habit:  
 Family history of heart disease: Yes/No Activity pattern:  
 Biochemical indices: Weight:  
 Past medical history:  
 Symptoms of MI:

***Clinical Profile***

	Patient Value	Normal Value
HDL-c		
VLDL-c		
LDL-c		
LDL/HDL		
Triglycerides		
Cholesterol		

**Step II: Assessment of the nutritional needs of the patient.**

Work out your calculations for reaching the modified RDI for Mr. Khanna and record those in the space provided herewith. Compare the RDA for Mr. Khanna (a patient with hypercholesterolemia and MI) with that of a healthy sedentary male.

Nutrients	Normal RDA for a Healthy Male	Modified RDA for Mr. Khanna
Calories (Kcal)		
Total fat (g)		
Cholesterol (mg)		
SFA		
PUFA		
Proteins (g)		
Carbohydrates (g)		
Salt (mg)		
Dietary fiber (mg)		

***Calculations:***

*List 4 main nutritional considerations/dietary goals for dietary management of Mr. Khanna*

**Step III: Based upon the modified RDI, now select exchanges for each food group.**

(Plan a food exchange plan for Mr. Khanna. Record the exchanges in the format given herewith).

Exchanges	No.	Calories (Kcal)	Carbohydrates (g)	Proteins (g)	Fat (g)
Milk					
Cereals					
Roots/Tubers					
Pulses					
Meat					
Other Vegetables					
Leafy Vegetables					
Fruits					
Sugar					
Fat					
<b>Total</b>					

**Step IV: Distribute the above selected exchanges according to the meal pattern most suitable for the patient.**

(Note: You may plan a different meal pattern than the one given in the format herewith).

Exchange	No.	Early Morning	Break-fast	Lunch	Evening Tea	Dinner
Milk						
Cereals						
Roots/Tubers						
Pulses						
Meat						
Green Leafy Vegetables						
Other Vegetables						
Fruits						
Sugar						
Fat						
<b>Total</b>						

**Step V:** Using the exchange available for each meal prepare a menu for Mr. Khanna by selecting the most appropriate foodstuffs.

**Menu for Mr. Verma**

Early Morning	Breakfast	Lunch	Evening Tea	Dinner

**Step VI:** Select appropriate quantities for each dish as per the exchanges available and calculate the nutrient content for the detailed diet plan as per the format given herewith.

Meal	Menu	Ingredient	Amt (g)	Exchange	Energy (Kcal)	Protein (g)	Sodium (mg)	Dietary Fibre
<b>Total</b>								

Meal	Menu	Ingredient	Amt. (g)	Exchange	Energy (Kcal)	Protein (g)	Sodium (mg)	Dietary Fibre
<b>Total</b>								

### Conclusion

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

Nutrient	Computed Amount through Diet Plan	Amount Computed for Modified RDI	Suggestions for Improvement
Energy (Kcal)			
Protein (g)			
Sodium (mg)			
Fibre (mg)			

List foods which can be allowed in abundance and should be taken in moderation by Mr. Khanna who is suffering from MI with hypercholesterolemia.

Foods that can be taken in Abundance	Foods to be Avoided

Submit the activity for evaluation.

## ACTIVITY

# 3

## DIET PLAN FOR CONGESTIVE HEART FAILURE

Date :

**Aim** : To plan a diet for a patient suffering from congestive heart failure.

**Case Study** : Asha Rani is a 75 year old retired teacher who is admitted with acute symptoms related to CHF which she has for the past 2 years and hypertension. She has a long history of heart disease including previous MI and mitral valve disease. She has ascites and pedal oedema. Electrocardiogram revealed cardiomegaly (enlarged heart) secondary to CHF.

Doctor has restricted her fluid intake to 1 liter a day. She has difficulty in eating due to severe nausea. Her calorie count during hospitalization was around 700 Kcal/day and 25-30 gms protein/day. At discharge, doctor recommends an 1800 Kcal diet, 80 gms protein/day and 1000 ml fluid with a low fat diet. To provide the calories, doctor had permitted her to use a whey protein powder to supplement her diet. Its values are (1 scoop of powder =35 grams) - (Energy = 133 Kcals; Carbohydrates = 9 gms; Protein = 21 gms; Fat = 1.5 gms)

Plan a diet for Asha Rani following the instructions given herewith.

### Introduction

(Describe briefly the Mr. Verma's disease condition in the space provided herewith).

**Step I : Identify specific disease characteristics of Asha Rani. Based on the risk factors, comment on the patient's profile in the format given herewith.**

### *Patient/Case Profile*

*Age:*

*Smoking habit:*

*Gender:*

*Drinking habit:*

*Past history of heart disease: Yes/No*

*Physical symptoms related to CHF:*



**Step II: Assessment of the nutritional needs of the patient.**

(Work out your calculations for reaching the modified RDI for Asha Rani and record those in the space provided herewith. Compare the RDA for Asha Rani with that of a healthy sedentary female).

Nutrients	Normal RDA for a Healthy Male	Modified RDA for Mr. Khanna
Calories (Kcal)		
Total fat (g)		
Cholesterol (mg)		
SFA		
PUFA		
Proteins (g)		
Carbohydrates (g)		
Salt (mg)		
Fluid Intake (ml)		

**Calculations:**

*List 4 main nutritional considerations/dietary goals for the treatment of this patient.*

**Step III: Plan a food exchange plan for Asha Rani**

(**Note:** The doctor has prescribed a 1800 Kcal and 80 gm protein diet. Due to nausea and poor appetite she is not eating much. But to provide the calories, doctor had permitted her to use a whey protein powder to supplement her diet. Its values are 1 scoop of powder = 35 grams. Energy = 133 Kcal; Carbohydrates = 9 gms; Protein = 21 gms; Fat = 1.5 gms). Using this powder 2 times a day, plan a food exchange for the patient).

Food group	Exchanges No.	Calories (Kcal)	Carbohydrates (g)	Proteins (g)	Fat (g)
Milk					
Cereals					
Roots/Tubers					
Pulses					
Meat					
Other Vegetables					
Leafy Vegetables					
Fruits					
Sugar					
Fat					
<b>Total</b>					

**Step IV: Distribute the above selected exchanges according to the meal pattern most suitable for the patient.**

(Note: You may plan a different meal pattern than the one given in the format herewith)

Exchange No.	Early Morning	Mid Morning	Break-fast	Lunch	Evening Tea	Dinner	After Dinner
Milk							
Cereals							
Roots/Tubers							
Pulses							
Meat							
Green Leafy Vegetables							
Other Vegetables							
Fruits							
Sugar							
Fat							
<b>Total</b>							

**Step V: Plan a menu for Asha Rani**

Using the exchange available for each meal prepare a menu for Asha Rani by selecting the most appropriate foodstuffs.

(Note: Do include the whey protein supplement in the menu).

*Menu for Asha Rani*

Early Morning	Mid Morning	Breakfast	Lunch	Evening Tea	Dinner	After Dinner



**Conclusion**

Compare the amount of the nutrients provided through the detailed menu plan with the amount of the nutrients computed for the modified RDI. Give your suggestions for improvement.

Nutrient	Computed Amount through Diet Plan	Amount as per the Modified RDI	± % of Difference	Suggestions for Improvement
Energy (Kcal)				
Protein(g)				
Sodium (mg)				
Fluid (ml)				

*Suggest why sodium restriction is recommended in CHF?*



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**Submit the activity for evaluation.**

\_\_\_\_\_  
**Counselor's Signature**