

A TEXT BOOK OF FOOD AND NUTRITION

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Harshwardhan Publication Pvt.Ltd.

Reg.No.U74120 MH2013 PTC 251205

At.Post.Limbaganesh,Tq.Dist.Beed

Pin-431126 (Maharashtra) Cell:07588057695,09850203295

harshwardhanpubli@gmail.com, vaidyawarta@gmail.com

All Types Educational & Reference Book Publisher & Distributors

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❖ **Publisher :**

Harshwardhan Publication Pvt. Ltd.
Limbaganesh, Dist. Beed (Maharashtra)
Pin-431126, vidyawarta@gmail.com

ISSN-2319 9318

❖ **Printed by :**

Harshwardhan Publication Pvt. Ltd.
Limbaganesh, Dist. Beed, Pin-431126



❖ **Page design & Cover :**
Shaikh Jahurodden

❖ **Edition: August 2019**

PRINTING AREA
ISSN 2319 9318
ISBN 978-93-89003-46-8

❖ **Price : 299/-**

PREFACE

Food and Nutrition book is much awaited by the authors. This book is written for the undergraduate students. The present book is being humbly offered to satisfy the demand for better, exhaustive and authoritative coverage on various aspects of food and nutrition.

We have written this text book, Food and Nutrition with full academic interest and by adding the essence of devotion, dedication and determination and urge to provide updated information to the students. The aim of this text book is to provide full details and the basic knowledge of the subject in the most effective and positive manner. The knowledge level of the students in the subject is always given top priority and hence the complicated concepts are simplified. The whole text book is readable and the same time made very informative. Exhaustive exercise is given for each topic to prepare the students for examination.

The very special features of this book are, adequate and accurate illustrations, the whole matter is fertilised with good, simple information. Each and every topic in fully illustrated, diagrams are necessary to understand the matter correctly.

We are extremely grateful to our Chairman, Principal of the respective college and authorities of BOS in Zoology, Kavayitri Bahinabai Chaudhari North Maharashtra University Jalgaon.

All comments and suggestion for the improvement of book will be thankfully accepted.

- **Authors**

PRINTING AREA
ISSN-2394-5303

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PRINTING AREA
ISSN-2394-5303

Hareshvardhan Publication Pvt.Ltd.
VIDYAWARTA
ISSN-2319 9318
International Multilingual Research Journal

Unit - 1

Introduction:

Food is the prime necessity of life. The food we eat is digested and assimilated in the body and used for its maintenance and growth. Food also provides energy for doing work. Man has cultivated variety of grains, fruits, vegetables, nuts and oilseeds and in rearing birds and animals for use as food.

The selection of foods best suited for promoting good health has been found out by trial and error by continues use. Use of milk of different mammals as food for infants has been practiced from very early times. A considerable amount of information is now available on the nutritive value of food and nutritional requirements.

Scope and Importance:

Nutrition and dietetics is a vital, growing field and the opportunities and possibilities in this field are endless. Nutritionists and dietitians (The person who is an expert in nutrition or dietetics) could found employment in hospitals, health and recreation clubs, canteens, nursing care facilities; teach the science of nutrition and dietetics in colleges and universities, catering departments of government etc.

The main field in which dieticians or nutritionists can work in a food service field, research and development and social welfare. Food service include food catering services, restaurants etc where professionalists can do menu planning, monitoring the food preparation etc.

Institutional catering is another field nutrition and dietetics professionals are needed to plan, supervise and prepare nutritious and well balanced meals for schools, colleges, factories or office canteens or cafeterias etc.

In health care field, people suffering from certain diseases, obesity etc need to take extra care of their eating habits and the kind of food they eat. Depending on the nutrition needs of patients, dieticians prepare their diet charts and monitor the results of dietary therapy and maintain records. Research and development involves conducting research on various food items to ensure their quality as well as studying the efforts of various types of diet on the body chemistry in labs. The research dieticians or nutritionists do research on nutritive value of food which helps to understand the various components of food we eat and the right type of food which provide a balanced mix of essentials like vitamins, minerals etc needed for human body.

Organizations involved in food product manufacturer use services of nutritionists and dieticians to plan and research new products as well as check the nutritional quality of their products. Research carrier occurs mainly in universities, specialists in institutions, food product manufacturing companies and hospitals.

Concepts and Significance:

Today's scientific understanding of human nutrition is one of the most important contributions of biochemistry. It has saved countless human lives or improved their quality. Until relatively recent time's pellagra, beriberi and rickets were endemic in many parts of the world. Today these diseases need no longer occur since we have the knowledge of nutrition, more than one-eighth of the worlds population us undernourished and paradoxically, many people in the most affluent (rich) countries are malnourished, not through deficiency if food but through consumption and other imbalances.

Food material that is metabolized by the body facilitating the building of tissue and liberation of energy. The science of nutrition tries to define the qualitative and quantitative requirements of the diet necessary to maintain the good health. Digestion and absorption of the food constitute the essential link between nutrition and metabolism. Overt (openly) nutritional deficiency is rare in more affluent populations, although the degree of nutritional deficiency may be present among the poor or the elderly and among groups with specialized nutritional requirements e.g. growing children, pregnant or lactating woman, ill patients, alcoholics or individuals on restricted diets from choice or necessity.

In more deprived populations, overt deficiencies are more widespread e.g. deficiency of protein (Kwashiorkor), vitamins (vitamin A in Xerophthalmia), minerals (iron in Anaemia), and energy (Starvation).

Although obesity has always been associated with dietary excess, the concept of excess intake of particular nutrients and their association with occurrence of certain diseases in developed societies is gaining recognition e.g. Atherosclerosis (a condition caused by intramural deposition of LDL (Low density lipids), secondary to exposure of smooth muscle of lipid, resulting in platelet induced smooth muscle proliferation, formation of fibrotic plaques and calcification) and coronary heart disease, diabetes and strokes and cirrhosis of liver metabolism of nutrients or defects in digestive enzymes also leads to pathogenic conditions e.g. malabsorption of vitamin B₁₂ and foliate causes Anemia, defects is calcium, magnesium and vitamin D absorption lead to Tetany and osteoporosis, lactase deficiency give rise to milk intolerance and defects in absorption of neutral amino acids are involved in Hartnup disease.

Functions of Food:**1) Physiological Function:**

- i) It provides energy to do work and to maintain body heat.
- ii) It provides material for growth of the body.
- iii) It provides material for the repair of damaged cells and tissues of our body.
- iv) It makes materials necessary for reproduction.

v) It regulates body processes to maintain life.

2) Social Functions:

Food has always been the central part of our community, social, cultural and religious life. It has been an expression of love, friendship and happiness at religious, social and family get-togethers. Food carries a lot of social significance. Warmth and friendship are expressed through sharing one's food or inviting people to dinner. To serve food at many social functions (marriage, birthday etc) is quite prevalent in our country. Even high dignitaries arrange social get together on certain religious occasions such as Id etc. Preparing special foods or one's favourite food is a way of showing respect or affection.

3) Psychological Functions:

In addition to satisfying physical and social needs, foods also satisfy certain emotional needs of human beings. These include a sense of security, love and acceptance. For example, preparation of delicious foods for family members is a token of love and affection.

We all have emotional needs such as need for love attention and security. Food can play important role in fulfilling these needs. A mother can express her love for her child by preparing the child's favourite meal. Food can be given as a reward for good behavior or deprived as a punishment for bad behavior.

People feel comfortable and secure when they are served food they have been used to consuming. Many people eat to relive anxiety and frustration, while some may eat less or refuse food when they are depressed and lonely.

Certain foods may be associated with sickness e.g. Sago kheer and Khichdi, while others such as Pedha are associated with good tidings. Food is therefore strongly associated with one's emotion and feelings.

Classification of Food and Proximate Components of Food:

Food vary widely in their contents of various nutrients, they have been classified into three groups on the nutritional basis - Energy yielding, Body building and Protective food.

1) Energy yielding foods:

Foods rich in carbohydrates and fats are called energy yielding foods. They provide energy to sustain the involuntary processes essential for continuance of life to carry out various professional, household and recreational activities and to convert food ingested into usable nutrients in the body. The energy needed is supplied by the oxidation of foods consumed. Cereals, roots and tubers, dried fruits, oils, butter and ghee are all good sources of energy.

2) Body building foods:

Foods rich in protein are called body building foods. Milk, meat, eggs and fish are rich in proteins of high quality. Pulses and nuts are good sources of protein but the protein is not of high quality. These foods help to maintain life and promote growth. They also supply energy.

3) Protective and Regulatory foods:

Foods rich in protein, minerals and vitamins are known as protective and regulatory foods. They are essential for health and regulate activities such as maintenance of body temperature, muscle contraction, control of water balance, clotting of blood, removal of waste products from the body and maintaining heartbeat. Milk, egg, liver, fruits and vegetables are protective foods.

Protective foods are further classified into two groups-

- i) Food rich in vitamins, minerals and proteins of high biological value. Exa - Milk, eggs and liver.
- ii) Food rich in certain vitamins and mineral only. Exa – Green leafy vegetables and fruits.

Proximate Components of Food:

Food is substance of animal and plant origin/source that yield heat and energy when ingested and absorbed by the body. Food nutrients build and renew tissues and regulate the body process.

Carbohydrates, proteins and fats are called as Proximate principles. They are oxidized in the body to provide the energy required for various activities of life. They also formulate the structural components of the body. Together with water, this is also a necessary dietary element, proximate principles from the main bulk of foods.

Amino acids, vitamins and mineral salts on the other hand play vital role in the regulation of several essential metabolic processes in the body. Some mineral salts are important components of body structures like bones and blood.

Carbohydrates:

Carbohydrates are the main source of energy doing work. The carbohydrates commonly occurring in foods are starch, cane sugar, glucose, fructose and milk sugar (lactose). About 50-70% of energy value (calorie value) in the average diet is provided by carbohydrates. They are the cheapest source of energy. Glucose derived from the digestion of carbohydrates is used as the main source of the energy in the body. Hence, the diets should contain adequate amount of carbohydrate to meet a greater part of energy needs.

Proteins:

Proteins are required for growth in children and maintenance of body weight in adults. Proteins are providing energy to a small amount (extent). Proteins constitute about 20% of the body weight. Body proteins are derived from the dietary proteins.

Proteins are made up of amino acids. The amino acid content of proteins from one protein to another is different. Hence, the nutritional value of proteins depends on their amino acid contents.

Fats:

Oil and fats serve mainly as the source of energy and they contain some essential nutrients like essential fatty acids and fat soluble vitamins. Fat is essential for maintaining good health as absence of fat leads to the development of a deficiency disease affecting the skin known as Phyrnoderma.

Minerals:

The body contains about 24 minerals all of which are derived from the diet. The important minerals are calcium, phosphorous, potassium, sodium, chloride, magnesium, iron, copper, iodine, fluorine and zinc.

The minerals are essential for various body functions –

- i) Calcium and phosphorous for the formation of bones and teeth.
- ii) Sodium, potassium, chlorine and phosphorous for maintaining water balance in the body.
- iii) Iron and copper for the formation of haemoglobin.
- iv) Iron for the normal functioning of thyroid gland.

Diets should, therefore provide adequate amounts of all the minerals.

Vitamins:

The food group contains certain chemical substances in small amounts which are called as Vitamins. About 17 different vitamins are discovered. All of them are essential for normal functioning of the human body. Inadequate intake of vitamins will lead to the development of deficiency diseases.

Vitamins are classified into two types –

- i) Fat soluble vitamins such as Vit. A, D, E and K.
- ii) Water soluble vitamins such as Vit. B₁, Riboflavin, Vit. B₆, Niacin, Panthothenic acid, Folic acid, Vit. C etc.

Water:

Water is often called the “forgotten nutrient.” Water is needed to replace body fluids lost primarily in urine and sweat. A person can survive weeks without food but only days without water. Water makes up 70 percent of body weight and is found in every cell in the body. It is the medium through which nutrients are transported from the digestive tract to the cells where they are needed.

Five Food Group Plan:

Foods are grouped on the basis of the predominant nutrients present in them. They may be classified into three, four, five, seven or eleven food groups. This classification varies from one country to another depending on many factors. For example, in India we do not have milk and milk products or flesh foods as a separate food group because of religion, economic reasons etc.

The five food group classification is used in India by ICMR as a guide to meal planning. Many factors have been considered while compiling these groups such as availability of food, cost, meal pattern and deficiency diseases prevalent. Not all foods in each group are equal in their nutrient content. That is why a variety of foods from each group should be included in the diet.

A classification based on nutrients present will ensure that all nutrients are made available to the body and offer greater variety within the group. The five basic food groups are –

- 1) Cereal and millets group
- 2) Protein or body building food group
- 3) Protective food group
- 4) Secondary protective food group
- 5) Fats and oils, sugar and jaggery group.

Significance of the five-food group system:

The five food group system/plan permits an individual to plan a menu to achieve nutrient intake as specified by RDA.

- i) Tool for nutritional assessment and screenings :

A brief dietary history system can disclose inadequacies of nutrient from any of the five groups. The information can be the first clue for the possibility of the subject may be at the risk of developing nutritional deficiency.

- ii) Tool for nutritional counseling :

The dietary history based on the five food group system allows a health team to counsel or teach a patient about nutrition.

Food Group	Sources	Main Nutrients
Cereal and Millets	All cereal and their products such as Wheat, rice, maize, millets such as jowar, bajra, ragi (Nagali), semolina, poha, bread, noodles, pizza, puffed cereals	Carbohydrates, partially complete proteins, fibre (except rice), B-complex vitamins, some are rich in iron or calcium.
Protective Foods	i) Yellow, orange and red fruits and vegetables such as mango, papaya, carrots, pumpkin. Green leafy vegetables such as spinach, fenugreek (clove), colocasia. ii) All citrus fruits, guava, tomato, pineapple, amia.	i) Rich source of carotene, iron, folic acid, fibre, other vitamins and minerals. ii) Rich source of ascorbic acid
Protein or body building foods	i) All pulses, nuts and oilseeds such as Bengal gram, green gram, red gram, black gram, lentil (Masur), soybeans, sprouts, groundnuts, sesame (Til), almonds.	i) Partially complete proteins, carbohydrates, iron, B-complex vitamins B ₁ , B ₂ , niacin. Soya bean and oilseeds provides fat. Sprouts provide vitamin C.

	ii) Milk and milk products such as whole milk, skim milk, curds, paneer, cheese, ice cream, buttermilk. iii) Meat, fish, poultry, egg.	ii) Complete protein, calcium, phosphorous, fat, vitamins A, B ₂ , B ₁₂ , cholesterol. iii) Protein, iron, fat, cholesterol, vitamins A, B ₁ , B ₂ , B ₁₂ , niacin.
Secondary protective group	i) All other fruits and vegetables not included in protective food group such as brinjal, beans, gourd vegetables, lady's finger, potato, onion yarn, colocasia, radish, beetroot. ii) Banana, apple, chikoo, grapes, melons, pears.	i) Carbohydrates, fibre, small amounts of vitamins and minerals. ii) Carbohydrates, fibre, small amounts of vitamins and minerals.
Fats and oils, sugar and jaggery	i) All fats such as vanaspati, margarine, shortenings, fresh cream, non dairy cream, butter, clarified butter. ii) All oils such as groundnut, corn, soya, rice bran, sesame, salad, oil, olive oil, fish oils. iii) Sugar, jaggery, honey, molasses, chocolates, jam, jellies, marmalade.	i) Calories, oils provide vitamin E and essential fatty acids. ii) Fats provide vitamins A and D. iii) Only calories. Jaggery, honey and preserves give very small amounts of minerals.

Balanced Diet:

A balanced diet means getting the right types and amounts of foods and drinks to supply nutrition and energy for maintaining body cells, tissues, and organs, and for supporting normal growth and development.

A diet which contains all the nutrients e.g. energy, proteins, fats, vitamins, minerals etc. required by a child for the proper maintenance of health and optimum growth is termed as a 'balanced diet'. Dals and beans have high contents of protein and a small amount of fat. Bread is rich in carbohydrates but poor in proteins.

A balanced diet and physical exercise has a major role in achieving long healthy life.

1. It helps in controlling body weight, heart rate and BP.
2. Increase in exercise capacity and muscle performance.
3. Improves blood sugar, lowers harmful cholesterol and triglycerides and increases the beneficial HDL cholesterol.
4. Produces mental and physical relaxation.

Some Greek Philosopher said "Leave your drugs in the chemist's pot if you can heal the patient with food." Scientifically, food is divided into five major groups, each group provide some but not

all the nutrients we need. Each food group is as important as another, no one can replace other. For good health, we need them all. The groups of food that make up a good diet and how much we need to eat from each group, which food we should eat more or less are as follows.

1. Vegetables, 2. Fruits, 3. Milk, Yogurt and Cheese, 4. Meat, Poultry, Fish, Dry Beans, Eggs, Nuts, Oilseeds and Sweets, 5. Bread, Cereal, Rice and Pasta, 6. Water

Vegetables

Vegetables in daily meals are very important. They are naturally low in fat and also provide fiber. Vegetables help to keep balance between the fluids of the body. They provide vitamins A and C and minerals, such as iron, magnesium and foliate. Vegetables also provide carbohydrates for the energy.

A small quantity of meat, eggs, milk or cheese mixed up with variety and combinations of vegetables provide the full range of amino acids, proteins, carbohydrates, vitamins and minerals. Carrots are a good source of vitamin A, tomatoes and cauliflower for vitamin C. Bunches of dark green vegetables (spinach) help keep you healthy. 3 to 5 servings of vegetables are an important part of a healthy diet.

If you're trying to lose weight or maintain your current weight while eating vegetarian meals, aim to fill half your plate with one or two of the following low-calorie vegetables: tomatoes, spinach, salad, carrots, broccoli, cauliflower, green beans, asparagus or bell peppers.

Starchy vegetables should not be used to fill half the plate, since they have about triple the calories of low-calorie vegetables. Starchy vegetables include green peas, corn, potatoes, sweet potatoes and winter squashes.

A serving of vegetables includes:

- 1 cup of raw, leafy vegetables;
- 1/2 cup of other vegetables cooked or chopped raw;
- 3/4 cup of vegetable juice.

Fruit Group

Fruits are wonderful because they are low in fat and sodium and provide important vitamins that keep you feeling fine and looking good. Fruit and fruit juices provide important amounts of vitamins A and C and potassium. Fruits also give you carbohydrates and all fruit is full of fiber. 2 to 4 daily servings of fruit play a big role in a good diet. Fruits are protective and regulatory in nature.

A serving of fruit includes:

- one medium apple or banana or orange.
- 1/2 cup chopped, cooked or canned raw fruit

- 3/4 cup of fruit juice.

Milk and Cheese Group

Milk products provide protein, vitamins and minerals. Eating and drinking milk and cheese is the best way to get your daily calcium. The most critical time to fill your bones with calcium is in your teen-age years. If you don't provide your body with sufficient calcium in your teens, your bones will be less dense throughout your life.

2 to 3 servings of this group are enough for healthy body. 2 servings are enough for most people and 3 for women who are pregnant or breastfeeding, teenagers and young adults to age 24. This food group helps in body building and gives energy to your body.

Cow's milk, buffalo milk, goat's milk, butter, ghee, paneer, cheese, kheer, payasam, rabdi, basundi and similar foods comes in this group.

A serving of milk includes:

- 1 cup (236 milliliters) of milk or yogurt
- 1 ounce (28 grams) of cheese
- 1 1/2 cups of ice cream or ice milk.

Meat, Poultry, Fish, Dry Beans, Eggs and Nuts Group

Meat, poultry, and fish supply protein, vitamin B, iron, and zinc. The other foods in this group - dry beans, eggs, and nuts - are similar to meats in providing protein and most vitamins and minerals. Mutton, chicken, eggs and all edible birds, fish, crab, lobsters and shrimp are examples of Meat, Poultry and Seafood; they are major source of protein and also provide significant amount of fat.

Groundnut, cashew nut, walnut and badam are examples of Nuts and Oilseeds. They are major source of fats and also provide protein.

2 to 3 servings from this group is sufficient for healthy body. This food group helps in body building and energy storing.

A serving of food from this group includes:

- 56 to 85 grams of cooked lean meat, poultry, or fish.
- 1/2 cup of cooked dry beans, 1 egg, or 2 tablespoons of peanut butter count as • 1 ounce of lean meat.

Fats, Oils and Sweets

Groundnut oil, coconut oil, sesame oil, sunflower oil, safflower oil, butter and ghee. Fat can be visible fat, like oil. There is also invisible fat that cannot be seen but is consumed. For example, nuts and oil seeds also contain fat. Fat could be vegetable fat or animal fat. Our body needs fats for some things, but it's smart to avoid eating too much of it. This food group has more calories than nutrition so we should always use it sparingly.

Sugary foods like candy and cookies are simple carbohydrates that can give you quick energy, they are usually loaded with calories and don't offer much in the way of nutrients.

Bread, Cereal, Rice and Pasta Group

The foods in this group should make up the biggest part of your total diet that is 6 to 11 servings in a day. These foods provide complex carbohydrates (starches), which are an important source of energy, especially in low fat diets. They also provide vitamins, minerals, fiber and some iron. Bread, cereal, rice, and pasta are all great sources of carbohydrate, the nutrient that the body uses as its major energy source.

The final quarter of your balanced vegetarian plate should be made up of whole grains. Choose whole grains over white, processed grains. Whole grains contain high fiber, so they are more filling and don't raise blood-sugar levels as much as other carbohydrates do. Also they have more disease-fighting phytochemicals.

Cereal and Millet:

This group includes rice, wheat, ragi, bajra, jowar, corn and all products made from them like cereal flakes, puffed cereals, noodles, macaroni, bread, pizza bread and cakes. A major source of carbohydrates and also provides fat. They give energy to body.

Pulse, Lentil and Legume:

Some examples are black, red and green gram, Bengal gram, cowpea, peas and rajma. They help in body building, a major source of protein and also provide fat and carbohydrate.

A serving of grains includes:

- 1 slice of bread
- 118 milliliters of cooked rice or pasta
- 28 grams of ready to eat cereal

Water

Water is often called the “forgotten nutrient.” Water is needed to replace body fluids lost primarily in urine and sweat. A person can survive weeks without food but only days without water. Water makes up 70 percent of body weight and is found in every cell in the body. It is the medium through which nutrients are transported from the digestive tract to the cells where they are needed.

Water is also the medium through which the by-products of cell metabolism are removed. Water also serves as the medium in which the chemical processes of life take place. It is normally taken into the body in beverages, soups and in the form of solid foods. Fluid needs are increased with sweating, vomiting, diarrhea, high-protein diets and in hot environments. An insufficient intake may cause dehydration, evidenced by loss of weight, increased body temperature, and dizziness.

A serving of water includes:

- Six to eight glasses of water should be ingested a day.

To make a complete, nutritious meal :

- Keep all the food groups in mind, you need them for the vitamins, minerals, carbohydrates and protein they provide.
- Make sure you choose something from the Grains group at every meal: this is the main source of energy for your body!
- Choose at least one fruit or vegetable at every meal: this will help to ensure you get the minimum number of daily servings
- To complete your meal, add a Milk or Meat/Alternative food... even better, add both!
- So...are you getting the 20 essential amino acids, 14 essential minerals and 13 essential vitamins in your daily diet to insure your "good health"?

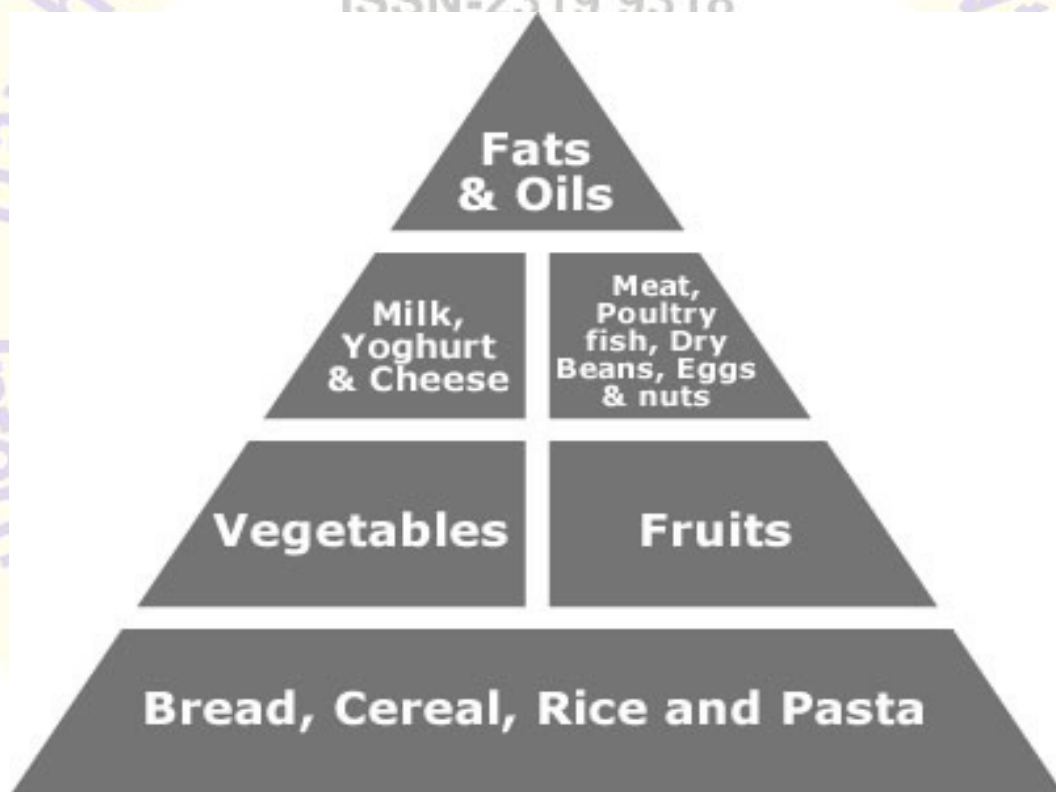


Fig. : Balanced Diet Pyramid

Food Group	Sources	No. of Serving	Main Nutrients
Vegetables (Green leafy)	Amarnath, Spinach, coriander leaves,	1 cup of raw, leafy vegetables	Invisible fat, calcium fibre, carotenoids,

	mustard leaves.		Vitamin B ₂ , folic acid and iron.
Other vegetables	Carrot, brinjal, lady finger, beans, onion, capsicum, cauliflower	1/2 cup of other vegetables cooked or chopped raw vegetables	Carotenoids, folic acid, calcium fibre.
Fruits	apples, guava, tomato ripe, papaya, orange, sweet lime, water melon	one medium apple or banana or orange	Fibre, Vitamin C, carotenoids.
Milk and meat products	Milk, skimmed milk and cheese.	2 servings per day	Protein, fat, Vitamin B ₂ , calcium.
Meat and chicken	Liver, fish, eggs, meat	one serving per day	Protein, fat and Vitamin B ₂ .
Pulses	Legumes, Bengal gram, black gram, green gram, red gram, rajmah, soyabean.	one serving per day	Energy, protein, invisible fats, Vitamin B, B ₂ , folic acid, calcium, iron, fibre.
Cereals, grains and products	Rice wheat flour, maize, rice flakes, puffed rice and maida.	6-7 servings per day	Energy, protein, invisible fat, Vitamin B, B ₂ , folic acid, iron and fibre.
Fat and sugar	butter, ghee, hydrogenated oils, cooking oils like ground nut, mustard and coconut oil	Fat – 3 tsp/day	Energy, fats and essential fatty acids.
Sugar	sugar and jaggery	2 tablespoon/day	Energy.
Water	Beverages, soups and in the form of solid foods	Six to eight glasses in a day	Medium for transportation of nutrients.

BALANCED DIETS FOR ADULTS

Food item	Adult Man			Adult Woman		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy

	work	work	work	work	work	work
Cereals and millets	470	550	750	370	450	575
Pulses	40	60	60	40	45	50
Leafy vegetables	100	100	100	100	100	100
Other vegetables	60	70	80	40	40	50
Roots and tubers	50	60	80	50	50	60
Fruits	30	30	30	30	30	30
Milk	150	200	250	100	150	200
Fats and oils	30	40	45	20	25	30
Sugar / Jaggery	30	40	50	25	30	30

BALANCED DIETS FOR CHILDREN AND ADOLESCENTS

Food Groups	Children Age in years			Adolescents Age in years					
	1-3	4-6	7-9	10-12		13-15		16-18	
				Boys	Girls	Boys	Girls	Boys	Girls
Cereals and millets	180	275	285	335	300	410	340	460	325
Pulses	25	35	60	60	60	60	60	60	50
Leafy vegetables	40	50	50	75	75	100	100	100	100
Other vegetables	20	30	50	50	50	75	75	75	75
Roots and tubers	10	20	30	30	30	50	50	50	50
Fruits	50	50	50	50	50	50	50	50	50
Milk	300	250	200	200	200	200	200	200	200
Fats and oils	15	25	30	30	30	50	40	50	40
Sugar / Jaggery	30	40	50	40	40	40	40	50	50

(For non-vegetarians substitute one pulse portion with one portion (50 g) of egg / meat / chicken / fish.)

Units of Energy:

The energy or calorific value of foods depends on the quantity of carbohydrates, fats and proteins present in them. This can be determined by oxidizing a known weight of food in an instrument called as Bomb calorimeter and measuring the heat produced.

The energy value of foods can be expressed in terms of kilo calories (Kcal) or mega joules (MJ). The unit Kilo Calorie has been in use till now. The International Union of Nutritional Sciences has suggested the use of Mega Joule (MJ) as the energy unit in place of Kcal.

Kilo Calorie : 1 kilogram calorie is the quantity of heat required to raise the temperature of 1 kg of water through 1°C. It is 1,000 times the small calorie used in physics.

Mega Joule : 1 kilo calorie equals 4.186 kilo joules.

Hence, 1,000 kilo calorie = 4.186×10^3 kilo joules or 4.186 mega joules.

1 Mega joule = 1,000 kilo joules

1 Mega joule = 239 Kcal

1 Kilo calorie = 4.186 kilo joules.

Direct and Indirect Calorimetry:

The metabolism of proteins, fats and carbohydrates in the body liberates energy which is used for work and maintenance of body temperature. Ultimately the energy output can be measured as heat output from the body. In a healthy adult man, since the heat output has to be replaced by furnishing equivalent amount of calories in food, the calorie requirement can be measured by measuring the calorie output.

The energy content of various foods can be measured by Direct calorimetry and by Indirect calorimetry.

Direct Calorimetry:

Measurement of heat actually produced by the organism which is confined in a sealed chamber or calorimeter. To measure heat by direct calorimetry, Atwater-Rosa-Benedict Respiration calorimeter is used.

Atwater-Rosa-Benedict Respiration Calorimeter:

The relation between energy output and oxygen consumed has been using the human respiration calorimeter.

This equipment consists of an air tight copper chamber insulated by wooden walls with air space in between. A folding bed, chair and table are provided in the chamber. A man can comfortably stay in the calorimeter for a few days and do some work such as reading, writing etc. A small opening is provided at the two ends for passing foods and drinks and removing the excreta. The chamber is ventilated by a current of air; the CO₂ and water given off are removed by soda lime and sulphuric acid respectively. Oxygen utilized by the subject is replaced by introducing known amounts of oxygen through gas meter into the chamber with air current.

From the above, the quantity of oxygen consumed and CO₂ produced can be calculated. The heat produced is measured accurately by circulating a current of water through copper pipes and measuring the quantity of water that has been circulated through the chamber and also the difference between the temperature of the water entering and leaving the chamber.

Exa. –

Adult weight	= 65 kg
Amount of heat output in 24 hrs.	= 2400 kcal
Amount of oxygen consumed in 24 hrs.	= 500 liters
Heat output per litre of oxygen consumed	= 4.8 kcal

Indirect Calorimetry:

Estimation of the heat produced by means of respiratory differences of oxygen and carbon dioxide in the inspired or expired air. For this reason, indirect calorimetry is considered to be the Gold standard for assessing energy expenditure in hospitalized patients. Indirect calorimetry uses a pain free breath test to precisely measure individual's unique metabolic characteristics.

To measure heat by indirect calorimetry, Oxy calorimeter is used.

Oxy Calorimeter:

It was devised by Benedict and coworkers. This instrument measures the volume of oxygen required to burn a known weight of the food.

The apparatus consists of combustion chamber, in which the weighed sample is burnt, a soda lime container for absorption of CO₂, a spirometer for measuring the O₂ used and a motor-blower unit for a circulating the gas mixture.

Using this instrument, the amount of O₂ consumed in burning of 1 g of pure carbohydrate, fat or protein can be determined.

The bomb calorimeter measures the heat produced when a food is actually burned where as the oxy calorimeter measures the oxygen used and CO₂ produced during the burning of a food.

BMR and Factors Affecting BMR:

The amount of energy required by the body for carrying out involuntary work and maintaining the body temperature is known as the Basal Metabolic Rate (BMR).

The involuntary work includes the functioning of various organs and systems which work continuously to keep the body processes going such as the heart and blood circulation, the kidneys and excretion. Approximately 1/3 of this energy is needed for these processes while the remaining 2/3 is utilized for maintenance of muscle tone.

Determination of Basal Metabolism:

Basal metabolism is usually determined by using Benedict and Roth apparatus. The apparatus is a closed circuit system in which the subject breathes in oxygen from a metal cylinder of about 6 lit. capacity and CO₂ produced is absorbed by soda lime present in the tower. The oxygen cylinder floats on water present in an outer tank. The subject wears a nose clip and breathes through a mouthpiece the oxygen present in the cylinder for a period of 6 minutes. The volume of O₂ used is recorded on a graph paper attached to a revolving drum by a pen attached to it. Since the subject is in the post-absorptive state. R.Q. is assumed to be 0.82 and the calorific value of one litre of O₂ consumed is taken as 4.8 Kcal.

Exa. –

Subject : Adult male, 50 kg body weight.

Oxygen consumed in 6 minutes = 1.1 litres.

Heat produced in 6 minutes = 4.8×1.1
= 5.28 Kcal.

Heat produced in 24 hours = $5.2 \times 60 \times 24$
= 1,267 Kcal.

The basal metabolism of the individual for 24 hours = 1,267 Kcal.

Factors Affecting BMR:

- 1) **Body size:** Heat is continuously lost through the skin. A tall well built person has a greater skin surface area than a shorter or smaller person and loses more heat through the skin and hence has a greater BMR.
- 2) **Body composition:** The amount of muscle tissue and adipose or fatty tissue in the body affects BMR. An athlete with well built muscles and little body fat has a higher BMR than a non-athlete with more body fat of the same weight. The metabolic activity in muscle tissue is much more as compared to adipose or fatty tissue.
- 3) **Age:** During periods of rapid growth, the BMR increases by 15-20% because the growth hormone stimulates cell metabolism and new cells are formed. It is high during infancy, pre-school years and puberty. During pregnancy and lactation it rapidly increases once again. The BMR gradually declines with age at the rate of 2% for each decade after the age of 21 years.
- 4) **Sex:** The BMR is 10% higher in males as compared to females. The difference in BMR is attributed to a higher proportion of adipose tissue in females and hormonal variations between the sexes.
- 5) **Fever:** Fever increases the BMR by 7% for each degree Fahrenheit rise in body temperature. This is one of the reasons for loss of weight during fever.
- 6) **State of Health:** The BMR is low during starvation and malnutrition because reduction in muscle tissue. In diseases and conditions where catabolic processes are high such as cancers, tuberculosis and burns BMR is high.
- 7) **Hormones:** Disorders of the thyroid gland markedly influence the BMR. Hyperthyroidism, a condition of excessive production of thyroid hormone increases BMR, and Hypothyroidism or decreased production of thyroid hormone decreases BMR.
- 8) **Exercise:** Physical exercise not only influences body weight by burning calories, it also increases BMR.
- 9) **Climate:** BMR rises when the climate is cold in order to maintain normal body temperature. In very warm climates leading to profuse sweating, BMR may increase by trying to reduce body temperature.

10) Psychological Tension: Worry and anxiety increase BMR.

Specific Dynamic Action (SDA):

Specific Dynamic Action (SDA) is a term used to describe the effect of food has in increasing the metabolic rate above the level found when fasting. Energy is needed to digest, absorb and metabolize the food we eat. Food intake stimulates the metabolism process leading to an increase in energy expenditure. This is known as the thermogenic effect of food or the specific dynamic effect.

Proteins have maximum effect on SDA, increasing the BMR by about 30% when eaten alone, while carbohydrates and fats show smaller increases. When eaten together in a normal mixed diet, the increase is about 5-10% of basal metabolism.

Rubner observed that, carbohydrates, fat and protein fed to a fasting dog, stimulated the energy metabolism over the basal level to varying extent. He found that, in a fasting dog requiring 400 Kcal, feeding of 100 gm of carbohydrates produces 425 Kcal, 44.4 gm fat produces 416 Kcal and 100 gm of protein produces 520 Kcal heat. The extra heat produced is given by the oxidation of tissue constituents and the animal will be in negative energy balance.

This stimulating effect of carbohydrate, fat and proteins on energy metabolism is called as Specific Dynamic Action (SDA).

The SDA of protein is the highest (30%), while that of carbohydrate and fat is only 6% and 4% respectively. The SDA of mixed diet containing 80 gm carbohydrates, 10 gm fats and 10 gm proteins is about 8%.

Respiratory Quotient:

During aerobic respiration oxygen is consumed and carbon dioxide is evolved. The ratio of the amount of carbon dioxide produced to the amount of oxygen consumed in a given time is called Respiratory quotient (RQ).

$$RQ = \frac{\text{Amount of CO}_2 \text{ produces in a given time}}{\text{Amount of O}_2 \text{ consumed in a given time}}$$

RQ is determined with the help of an apparatus called Respirometer. The RQ depends upon the type of respiratory substrate used during respiration. It is different for different substrates

For carbohydrates this ratio is one, for proteins and fat this ratio is always less than one. Thus by calculating ratio of CO₂ produced and O₂ consume one can predict the type of quality of food.

If diet consists of high carbohydrates then RQ is closed to one. If diet contains more fat then RQ is around 0.74 and if diet contains more proteins them it is around 0.8. In this way by knowing RQ one can find out quality of food consumed by animal.

Carbohydrates:

The value of RQ is equal to 1 if carbohydrates are the respiratory substrates in aerobic respiration.

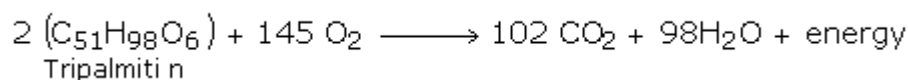


$$\text{RQ} = \frac{6 \text{CO}_2}{6 \text{O}_2} = 1$$

Fats:

When the respiratory substrate is fat the RQ is about 0.7

Example – Tripalmitin



$$\text{RQ} = \frac{102 \text{CO}_2}{145 \text{O}_2} = 0.7$$

Fats contain less oxygen than carbohydrates and so they require more oxygen for oxidation

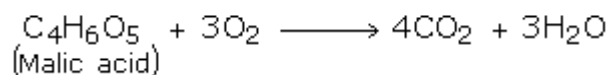
Proteins:

Protein is not completely oxidized in the tissues but its R.Q. can be determined by indirect means and it is in between 0.8 to 0.82.

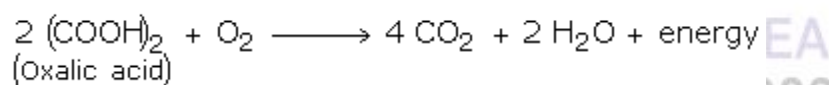
Organic acids

When organic acids are broken down as respiratory substrates under aerobic conditions the RQ is more than one. Organic acids contain more oxygen than carbohydrates and therefore require less oxygen for their oxidation

Example –



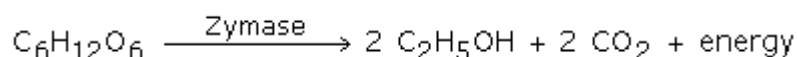
$$\text{RQ} = \frac{4 \text{CO}_2}{3 \text{O}_2} = 1.33$$



$$\text{RQ} = \frac{4 \text{CO}_2}{1 \text{O}_2} = 4$$

Anaerobic Respiration:

The value of RQ is infinity during anaerobic respiration because CO_2 is produced but O_2 is not utilized



$$RQ = \frac{2CO_2}{O_2} = \text{Infinity } (\infty)$$

From the R.Q. a rough idea about the kind of diet utilized, can be received because it is likely that other substances may be metabolized and there is also a possibility of interconversion of food substances within the body of animal. From the above mentioned figures it can be said that. Omnivorous diet should be represented by an R.Q. about 0.85 while a high carbohydrate diet gives a figure above 0.9. It cautiously measured R.Q. exceeds unity (i.e. 1). It indicates that fats must have been formed from carbohydrates. Conversely, R.Q. below 0.7 indicates that carbohydrates must have been formed from fat.

Normal R.Q. for man is 0.85 suggesting that carbohydrate is an important source of energy, but that either fat or protein or both as well as are used.

If O₂ is taken as a unit, the energy available from three food stuffs does not vary much.

1 gm of O₂ oxidises carbohydrate to give 3.8 Kcal.

1 gm of O₂ oxidises fat to give 3.2 Kcal.

1 gm of O₂ oxidised protein to give 3.1 kcal.

However, 1 gm of O₂ can oxidize 0.94 gm glucose or 0.34 gm Triesterin. Thus 1 gm of glucose gives 4.1 Kcal energy while the same amount of fat provides 9.3 kcal. Fat is therefore a more economical form to store energy. For the very reason hibernating or migratory animals lay down much fat earlier. Protein can produce about 4 Kcal/gm.

Food Nutrition and Health:

To live one must eat. But, we not only eat to live, what we eat also affects our ability to keep healthy, do work, to be happy and to live well. Knowledge of what to eat and in what quantities is a prerequisite to the healthy and happy life.

Nutrition is the science that deals with all the various factors of which food is composed and the way in which proper nourishment is brought about. The average nutritional requirements of groups of people are fixed and depend on such as age, sex, height, weight, degree of activity and rate of growth.

Food is anything solid or liquid that has a chemical composition which enables it, when swallowed to do one or more of the following

1. Provide the body with the material from which it can produce heat or any form of energy.
2. Provide material to allow growth, maintenance, repair or reproduction to proceed.
3. Supply substances, which normally regulate the production of energy or the process of growth, repair or reproduction.

Good nutrition requires a satisfactory diet, which is capable of supporting the individual consuming it, in a state of good health by providing the desired nutrients in required amounts. It

must provide the right amount of fuel to execute normal physical activity. If the total amount of nutrients provided in the diet is insufficient, a state of under nutrition will develop.

The council on Food and Nutrition of the American Medical Association defines nutrition as “The science of foods, the nutrients and the substances therein, their action, interaction and balance in relation to health and diseases. Nutrition science is the area of knowledge regarding the role of food in the maintenance of good health. Thus nutrition is the study of food at work in our body.

Health is defined by the World Health Organization of the United Nations as the “State of complete physical, mental and social well- being and not merely the absence of disease and infirmity (or ill- health/illness)”

Nutrition is one key to developing and maintaining a state of health that is optimal for you. In addition, a poor diet coupled with a sedentary lifestyle is known to be risk factors for life-threatening chronic diseases like Heart disease, Stroke, Hypertension, Diabetes and some forms of Cancer and finally death. The major health problems in the United States are largely caused by excessive energy intake and not enough physical activity.

An adequate diet should contain liberal amounts of protein-rich and protective foods and should apply all the dietary essentials in the required amounts. Dietary surveys carried out in Western countries have shown that the diets contain large amounts of protein-rich and protein foods such as milk, eggs, meat and fish and provide all the nutrients in adequate amounts. The rate of growth of children and the nutritional status of the population are very good.

Studies carried out in U.K. and U.S.A has been shown that the quality of diets consumed by the people during the period of 1910-1960 has been steadily improving and consequently the growth rate of children has been steadily increasing during the above period. After 1960, there has been no further significant increase in the growth rate of children indicating thereby that the diets have been adequate for promoting maximum growth in children.

On the other hand, the diets consumed by a majority of the population in developing countries of Asia, Africa and Latin America are based mainly on energy yielding foods and contain only small amounts of protective and protein-rich foods. Such diets are deficient in proteins, certain vitamins and minerals. A fair section of the population does not get enough food to eat and their diets are deficient in calories also. The rate of growth of children in developing countries is poor. The children are malnourished, emaciated and stunted.

Studies carried out in several nutrition research laboratories in India and other countries have shown that supplementation of the diets with extra cereals, legumes and green leafy vegetables or with processed food supplements based on cereals, oilseed meals and essential vitamins and minerals can help effectively to overcome malnutrition and improve health and nutritional status of the population.

Nutrition is an input to and foundation for health and development. Interaction of infection and malnutrition is well-documented. Better nutrition means stronger immune systems, less illness and better health. Healthy children learn better. Healthy people are stronger, are more productive and more able to create opportunities to gradually break the cycles of both poverty and hunger in a sustainable way. Better nutrition is a prime entry point to ending poverty and a milestone to achieving better quality of life.



Unit – 2

Carbohydrates and Proteins

CARBOHYDRATES:

Composition and Sources:

Carbohydrates provide fuel or energy for the human body. These organic (carbon -containing) compounds are an integral part of both plant and animal life and life as we know it could not exist without them.

Carbohydrates are made up of three elements - carbon, hydrogen and oxygen. Carbohydrates along with proteins and fats comprise the major components of living matter and are used for maintenance of cellular functional activities and as reserve and structural materials for cells.

Carbohydrates are formed by green plants in the process of photosynthesis. Humans get their carbohydrate needs most efficiently from the plant world.

Sources of Carbohydrates:

Carbohydrates are one of the three major macro-nutrients which supply the body with energy. Fat and protein are the others. It is recommended that about 55% of our daily calories should come from carbohydrates, 15 % from protein and 30 % from fat.

Carbohydrates (sugar and starches) are the most efficient sources of energy and are known as the “fuel of life.” Carbohydrates take the form of sugars, oligosaccharides, starches and fibres. The major sources of carbohydrates are cereals, pulses, potatoes. But also fruit and vegetables contain carbohydrates and even milk.

The new nutritional guidelines established by the Food and Drug Administration (FDA) recommend that complex carbohydrates and naturally occurring sugars (found primarily in fruit) make up approximately 50 percent of one’s total caloric intake. The FDA also recommends that refined and processed sugars make up no more than 10 percent of the calories in one’s diet. Each gram of carbohydrate yields 4 calories in the process of its metabolism.

Carbohydrates are abundantly found in most plant food sources. Complex carbohydrates (starches) are in breads, cereals, pasta, rice, dry beans and peas and other vegetables, such as potatoes and corn. Simple carbohydrates are found in sugars, honey, syrup, jam and many desserts.

- 1) Cereals: Wheat, Rice, Jowar, Bajara, Ragi, Oats, barley, Corn etc.
- 2) Pulses: All whole grain and dehusked pulses and their by-products. Rajmah, Bengal gram, Whole green gram, Lentils and besan.
- 3) Fruits and Vegetables: Mango, Chikoo, Jack fruit, Custard apple, Banana, Green peas, Beans, Potato etc.
- 4) Nuts and Oilseeds: Cashew nuts, Coconut (dry), Ground nuts, Garden cress seeds, Gingelly seeds.
- 5) Sweets: Sugar, Jaggery, Honey, Sago, Tapioca, Dates, Raisins, Skimmed milk powder.

Carbohydrate content of some foods:

Name of food	Carbohydrates g/100 g
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Cereals and millets (Rice, Jowar etc)	63-79
Pulses (Bengal gram, Red gram etc)	56-60
Nuts and Oilseeds	10-25
Roots and Tubers (Potato, Tapioca, Sweet potato etc)	22-39
Arrow root flour	85-87
Cane sugar	99
Sago	87-89
Honey	79-80
Jaggery	94-95
Milk (Fluid)	4-5
Dried fruits (Raisin, Dates etc)	67-77
Fresh fruits	10-25

Nutritional Value/Energy value/Fuel Value of Carbohydrate:

Energy has traditionally been expressed as calories or kilocalories. More recently, the units of energy have been changed to kilojoules. There are 4.2 kilojoules in 1 kilocalorie. The energy value of a food indicates its value to the body as a fuel. This may be less than the heat value obtained experimentally by 'burning' the food outside the body in what is called a 'bomb calorimeter'. After a food is ingested, some of its energy may be 'lost' during digestion and metabolism. The first system for giving energy values to the macronutrients was described by Dr W. O. Atwater in 1899.

Energy requirement means the amount energy needed to maintain the basic processes of life at rest, that is, basal metabolism, plus the amount needed for physical activity under a variety of circumstances. Body weight is an important factor in determining how much energy we need, since more energy will be needed to sustain and move a greater body mass.

	kilojoules per gram	kilocalories per gram
Fat	37	9
Alcohol	29	7
Protein	17	4
Carbohydrate	16	4

Recommended Dietary Allowances (RDA):

For maintaining good health and physical efficiency, the diet should provide adequate amounts of all nutrients. In designing balanced diets, it is essential to know the daily requirements of different nutrients. Dietary Allowances for nutrients have been recommended by various National and International Committees –

- i) Nutrition Expert Committee, I.C.M.R., India (1968),
- ii) Food and nutrition Board, National Research Centre, U.S.A. (1974),
- iii) Panel of Recommended Allowances of Nutrients, Department of Health and Social Services, U.K. (1969) and
- iv) Human Nutritional Requirements, FAO/WHO (1974).

In estimating the calorie requirements the factors like Physical activity, Body size and composition, Age and sex, Physiological state and Climate and environment are important. The RDA is based on requirements.

The requirement for a particular nutrient is the minimum level that needs to be consumed to perform specific functions in the body and to prevent deficiency symptoms. It should also maintain satisfactory stores of the nutrients in the body.

Recommended Dietary Allowances are based on a person's requirements for different nutrient.

Recommended Dietary Allowances = Requirement + Margin of safety.

The margin of safety is added to take care of factors such as,

- i) Losses during cooking and processing,
- ii) Short periods of deficient intake,
- iii) Nature of the diet,
- iv) Individual variations in requirements.

Exa. – i) The requirement for iron in Western countries is 10 mg for adult men and 15 mg for adult women respectively while Indian RDA's suggest an intake of 28 mg for adult men and 30 mg for adult woman. This is because the form of iron consumed varied and the factors interfering with absorption of iron such phytates in cereals and larger proportions of non-haeme iron present in Indian diets.

ii) The requirement for Vitamin C or Ascorbic acid is actually 20 mg, but since the vitamin is easily destroyed during pre-preparation, cooking and storage, the recommended intake is twice the requirement and is 40 mg/day.

Required Daily Allowances of Carbohydrates:

The body has a specific need for carbohydrates as a source of energy for the brain and other tissue cells, for the synthesis of lactose of milk (lactating women) and galactose and other sugars present in cerebrosides, muco-polysaccharides etc. Carbohydrate is essential for the oxidation of fat and for the synthesis of certain non-essential amino acids.

The percentage of calories derived from carbohydrates in the diets consumed by a vast majority of people in the developing countries is as high as 60-70 % while it is 40-50% in Europe and 30-40% in U.S.A. The carbohydrate calories should be at least 40% in well balanced diets.

The level of carbohydrate calories in the diet will also depend on availability of fat and the economic conditions of the people as fat is about twice as costly cereals on equicalorie basis in developing countries.

The RDA for carbohydrates has been established at 130 grams per day. Approximately 55% of the energy (Calories) in your diet should be from carbohydrates. Of course, carbohydrates from fresh vegetables and fruits are the best source, along with carbohydrates from whole grains and beans.

The Recommended Dietary Allowance (RDA) for carbohydrate:

RDA for Children	
1–3 years	130 g/d of carbohydrate
4–8 years	130 g/d of carbohydrate
RDA for Boys	
9–13 years	130 g/d of carbohydrate
14–18 years	130 g/d of carbohydrate
RDA for Girls	
9–13 years	130 g/d of carbohydrate
14–18 years	130 g/d of carbohydrate

Optimal level of carbohydrates in the diet, taking into account the physiological needs for proteins and fats:

Age Group	Optimal level of carbohydrate calories as % of total calories
Adult	50-70
Expectant and nursing mothers	40-60
Infants (1-12 months)	40-50
Preschool children (1-5 years)	40-60
Older children and adolescents	50-70

Deficiency and Excess intake Disease:

Carbohydrates may directly influence human diseases by affecting physiological and metabolic processes, thereby reducing risk factors for the disease or the disease process itself. Carbohydrates may also have indirect effects on diseases, for example, by displacing other nutrients or facilitating increased intakes of a wide range of other substances frequently found in

carbohydrate-containing foods. Evidence of associations between carbohydrates and diseases comes from epidemiological and clinical studies.

Carbohydrates Deficiency Diseases:

The daily diet should not contain less than 100 g of carbohydrate. The carbohydrate deficiency is uncommon in our country as diets are cereal based. A deficiency of carbohydrate in the diet results in utilization of fat for energy. In severe deficiency, incomplete oxidation of fats caused ketone bodies to accumulate in the blood, resulting in a condition called Ketosis.

Excess Carbohydrates Intake Diseases:

- 1) Excess consumption of refined sugars could be one of the causes of dental caries or tooth decay.
- 2) Excess sugar depresses the appetite, provides hollow calories and could result in malnutrition.
- 3) High intake of sugar and refined carbohydrates increase the blood triglyceride levels leading to heart diseases.
- 4) When excess carbohydrates are consumed they are converted into fat and deposited in the adipose tissue, which could lead to obesity, i.e. body weight of 20 % or more than desirable weight.
- 5) Excessive fibre could irritate the intestinal lining causing cramps or bloating due to gas formation.
- 6) Excess fibre interferes with the absorption and availability of mineral elements such as iron and calcium.

Biological Importance of Carbohydrates:

Carbohydrates play vital role in the human body.

- 1) The chief function of carbohydrate is to provide energy to the body so that it can carry out day-to-day work and maintain body temperature. All carbohydrates except fibre provide 4 Kcal/g of energy. It is the cheapest source of energy available.
- 2) Glucose is the only form of energy used by the central nervous system. When blood glucose level fall, the brain does not receive energy and convulsions may occur.
- 3) Carbohydrates spare proteins from being broken down for energy and are used for body building and repair. In carbohydrate deficient diets, proteins meant for body building and repair are oxidized to meet the most important and first need to the body, i.e. energy.
- 4) They are required for complete oxidation of fat. In a deficiency, fats are broken down rapidly for energy and intermediate products such as ketones are formed in large amounts resulting in a condition called as Ketosis.
- 5) Carbohydrates can be converted into non-essential amino acids, provided a source of nitrogen is available.

- 6) The sugar lactose helps in the absorption of the minerals calcium and phosphorous.
- 7) Lactose helps certain bacteria to grow in the intestine. This bacterial flora is capable of synthesizing B-complex vitamins in the gut.
- 8) Dietary fibre plays an important role of increasing faecal mass by absorbing and holding water, stimulating peristalsis and eliminating faecal waste.
- 9) Fibre also helps in lowering blood cholesterol levels by binding bile acids and cholesterol.

PROTEINS:

Composition and Sources:

Proteins are large, complex, organic compounds made up of carbon, hydrogen, oxygen and nitrogen. The basic unit of protein is amino acid. Each amino acid contains a carboxyl group (COOH) and acid group and an amino group (NH₂) or basic group.

Classification of proteins:

Proteins may be classified 1) on the basis of their structure and 2) on the basis of their quality or nutrition value i.e. the amino acids present in them.

1) Classification of proteins by Structure:

On the basis of structure proteins are classified into three types –

i) Simple Protein:

These proteins are made up of amino acids only. Exa. – Zein in corn, Albumin in egg white and Gliadin in wheat consists of amino acids only.

iii) Conjugated Proteins:

These proteins have a non-protein molecule attached to the protein. Exa. – Blood protein haemoglobin, which contains a haeme (iron) group attached to protein and milk protein casein, which has a phosphate group attached.

iv) Derived Proteins:

These result from a partial breakdown of a native protein. Proteases, peptones and polypeptides are formed when digestive enzymes begin their action on proteins.

2) Classification of Proteins by Nutrition or Quality:

Proteins are classified into three groups on the basis of their nutrition or quality.

i) First Class Protein or Complete Proteins:

These proteins contain all essential amino acids in sufficient proportions and amounts to meet the body's need for growth and repair of tissue cells. A complete protein food has a high BV. They are found in animal foods.

Exa. – Eggs, milk, meat, fish and poultry are complete protein foods.

ii) Second Class Protein or Partially Complete Proteins:

These are proteins in which one or more essential amino acids are present in inadequate amounts. They cannot synthesize tissues without the help of other proteins. The value of each is increased when it is consumed in combination with another incomplete protein at the same meal. They can maintain life. They are found in plant foods. Exa. – Cereals, pulses, nuts and oilseed are partially complete protein foods. Cereals contain inadequate amounts of essential amino acid lysine and pulses are deficient in essential amino acid, methionine.

iii) Incomplete Proteins:

These proteins are incapable of growth and repair of body cells. They cannot maintain life. One or more essential amino acids may be completely lacking in these proteins. Exa. – Gelatin and Zein in corn. Gelatin lacks three essential amino acids and is the only animal protein which is incomplete.

Sources of Proteins:

Protein is the basic material of every living cell. It is the only nutrient that can make new cells and rebuild tissues. Therefore, adequate amount of protein in diet is essential for normal growth and development and for the maintenance of health.

No two food proteins are identical in their quality. The quality of protein depends upon the kind and amount of amino acids present in them in relation to the body needs. Protein quality is an important criterion for tissue synthesis. Each body protein performs a specific function and cannot be replaced by another protein.

Proteins are present in both plant and animal foods. Animal food sources provide the highest quality or complete proteins such as eggs, milk and milk products – cheese, paneer, mawa, milk powder, curds, condensed milk; meat, fish, shell fish, poultry and organ meats.

Pulses, especially soya bean (43% protein) and its products such soya milk, tofu textured vegetable proteins, nuts and oilseeds – groundnut and gingelly seeds are important sources of protein in Indian diet. Cereals contain 6-12% partially complete proteins and as they form the bulk of the diet, they contribute significantly to the protein content. Vegetables, with the exception of peas and beans are poor sources of protein. Green leafy vegetables contain a small percentage of good quality protein (approximately 1-3%). Fruits do not contribute towards the protein content of the diet.

The average adult needs about half a gram of protein per pound of healthy weight.

Sources	Protein content in grams
Eggs - 1 medium size	6
Milk - 1 pint or 568 ml	19
Milk - 1 glass	6.3
Soya milk plain - 200 ml	6
Tofu - 100 gm	8
Low-fat yoghurt (Plain) - 150 g	8
Low-fat-yoghurt (Fruit) - 150 g	6
Fish (Cod fillets) - 100g or 3.5 ounces	21
Cheese cheddar - 100g or 3.5 ounces	25
Roast Beef - 100 g or 3.5 ounces	28
Roast Chicken - 100 g or 3.5 ounces	25
Other meats Average - 100g or 3.5 ounces	25
Lentils, cooked - 1 cup	18
Black Beans, cooked - 1 cup	15
Peanut butter - 1 tbsp	8
Almonds - ¼ cup	8
Brown Rice, cooked - 1 cup	5
Broccoli, cooked - 1 cup	4
Potato - 1 medium	4

Nutritional value/Energy value/Fuel value of Proteins:

A protein's nutritional value is judged by how many of the essential amino acids it provides and in what quantity. Different foods contain different numbers and amounts of amino acids.

- Animal products (such as chicken, beef or fish) contain all of the essential amino acids.
- Plant proteins usually lack at least one amino acid. Exceptions to this are soy products and the seed of a leafy green called Amaranth (consumed in Asia and the Mediterranean).

Strict vegetarians can solve this dietary problem by eating a combination of plant foods. For example, a meal containing cereals and legumes provides all the essential amino acids found in a typical meat dish.

Required Daily or Recommended Dietary Allowances of Proteins:

Many factors affect the protein requirement of an individual such as, body weight, special physiological needs, adequacy of calorie intake, quality of protein and efficiency of digestion, previous state of nutrition.

Group	Particulars	Body weight (kg)	Protein (g/day)
Man	Adult	60	60
Woman	Adult	50	50
	Pregnancy		+15

	Lactation (0-6 months)		+25
	(6-12 months)		+18
Infants	0-6 months	5.4	2.05 g/kg
	6-12 months	8.6	1.65 g/kg
Children	1-3 years	12.2	22
	4-6 years	19.0	30
	7-9 years	26.9	41
Boys	10-12 years	35.4	54
	13-15 years	47.8	70
	16-18 years	57.1	78
Girls	10-12 years	31.5	57
	13-15 years	46.7	65
	16-18 years	49.9	63

Deficiency and Excess Intake Disease of Proteins:

For healthy growth of body, a balanced diet is a must. A balanced diet means a diet that consists of vitamins, proteins, minerals, fats, carbohydrates and all other things that may be required to maintain the proper functioning of every part of the body.

Proteins are one of the most vital substances required by the body to function properly. They constitute 75% of the body mass and are present in each and every part of the body right from hair, bones, skin, muscles and all other parts of the body. Proteins are the carriers of oxygen in the blood and energy source for all the chemical reactions in the body.

While an excess of any of the above mentioned substances can cause disorders, shortage or inadequate consumption can also cause serious disorders.

Protein Deficiency Diseases:

- i) A reduced protein intake over a prolonged period of time leads to loss of weight, fatigue, anemia, nutritional oedema, lowered resistance to infection and poor healing of wounds.
- ii) Protein deficiency is more marked during periods when proteins needs are more e.g. during infancy, childhood, pregnancy and lactation. Deficiency occurs when an individual does not eat enough proteins.
- iii) It is one of the reasons for diseases like breast cancer, colon cancer, heart disease and osteoporosis.
- iv) Congenital protein C or S deficiency causes abnormal blood clotting. This disorder causes an increased risk of clot formation, called thrombosis.
- v) Inadequate supply of proteins in the food consumed among small children in the age group of 1-3 years caused a disease called Kwashiorkor. A child suffering from this disease has a very poor diet with stunted growth, bulging eyes, long curved thin legs, dark skin and luster less hair.

The disease can be prevented or controlled by giving high protein diet to the patient with lots of whole wheat, jaggery, gram, beans, peanut etc.

- vi) Protein energy malnutrition leads to Marasmus diseases. This is mainly caused in infants and is due to deficiency in proteins and not the calories. This is more prevalent in developing countries due to the early replacement of mother's milk with other sources of food. The most common symptoms of the disease are that the infant develops a shriveled look, the ribs become prominent and the limbs become very thin.

Severe diarrhea and other digestive disorders occur leading to a retarded physical and mental growth. The disease can be prevented or controlled by administering a protein rich diet like a combination of wheat, gram, peanut, soybean or a diet that has animal protein like fish, mutton, chicken that can help the patient to return to normal condition.

- vii) Protein deficiency also causes numerous problems like loss of weight, weakness, shrinkage of muscle tissue and edema. Other syndromes include unusually low blood pressure, unusually low heart rate, anemia and pigmentation on the skin. The metabolism rate is also likely to decrease. It is also believed to lead to fatty infiltration and cirrhosis of the liver.
- viii) Protein deficiency also results in poor healing of wounds. This increases the risk of surgery.
- ix) The protein deficiency symptoms are - Hair Loss, Lethargy and weakness, Skin rashes, Weight loss, Trouble falling asleep, Delayed wound healing leading to protein deficiency infections, Muscle cramps, Brittle nails, Ridges in finger and toe nails, Skin ulcers, Headache and nausea, Edema (water retention in legs, feet, hands, etc.), Mood swings, Depression and anxiety.

Excess Protein Intake Diseases:

A high protein intake has many disadvantages –

- i) When protein is consumed in greater amounts than can be processed by the body, toxicity results from the excessive amount of nitrogen in the blood. This extra nitrogen accumulates as kinotoxin in the muscles and causes chronic fatigue.
- ii) Proteinosis or acute protein poisoning causes headaches and a general aching. Various symptoms of protein poisoning such as a burning of the mouth, lips and throat, rashes, etc. are very similar to the symptoms attributed to allergies. In fact, many so-called allergies may be cases of protein poisoning instead.
- iii) Once the body needs have been taken care of, the excess protein is deaminated by the liver and urea is synthesized. The kidneys have to work more to excrete the additional amount of urea. A high protein intake is an unnecessary burden on two vital organs i.e. liver and the kidneys. If these organs are diseased, toxic wastes tend to accumulate in the body.

- iv) When animal proteins such as meat, poultry and whole milk products form a substantial part of the high-protein diet, there is a risk of high blood levels of cholesterol.
- v) A high intake of protein increases the loss of calcium through the urine.
- vi) Protein rich foods are much costlier, are in short supply and are not an economical source of energy.

Biological Importance of Proteins:

Protein is the fundamental life force. Proteins are necessary in initiating every biochemical process in the body as well as in providing us an invaluable source of energy. In the absence of protein, the body would simply shut down.

i) Protein as Enzymes:

Proteins are responsible for almost every chemical reaction that takes place in the body. These reactions are facilitated by enzymes, which are actually protein catalysts that increase the rate of reaction without themselves being changed in the process.

The amount of enzymes present in the body determines the rate at which a chemical event can occur. Thus if there is deficiency in enzymes, there will be a slower reaction.

Several thousand enzymes have been discovered to date and virtually every one is a protein.

ii) Transportation and Storage:

Proteins have a unique ability to transport substances across cell membranes that other molecules can't penetrate. Hemoglobin is a type of protein that is responsible for carrying oxygen in red blood cell. Myoglobin is responsible for carrying oxygen. Ferritin is a protein that assists in the storage of iron and stores blood in the liver. Without protein for transportation and storage, we would not have blood to nourish our bodies.

iii) Cell and Tissue Growth:

Continuous supply of amino acids needed by the body in order to build the proteins that create tissue. Throughout our everyday lives, we constantly manufacture new tissues such as hair, teeth, skin and nails. The blood cells and skin cells last about a month while the cells situated in our digestive system lining last only two weeks. When the cells die and slough off, our bodies need new healthy tissue to replace them. It is only through the regeneration of new tissue that we can become healthy again.

iv) Mechanical Support:

Collagen, the most abundant protein found in the human body is a type of structural protein that is fibrous in nature. Collagen is responsible for giving strength and support to tissues such as skin and bone that undergo continual wear and tear.

Athletes that work out two or more hours a day rely on the body's ability to manufacture new collagen, which keeps their joints healthy and strong and prevents injury.

v) Coordination and Motion:

Proteins are a major component in muscle contraction. Muscle contraction occurs when two fibrous protein filament glide across each other. On a smaller scale, sperms are propelled in motion by their flagella, which are made up of contractile units made of protein. Thus protein is mainly behind the movement of sperm.

vi) Immune Protection:

Antibodies are highly specific proteins that are responsible for detecting a foreign substance or known as "antigen". The body produces a specific antibody to respond to an antigen and inactivate it.

vii) Nerve generation and Impulses:

The nervous system is responsible for keeping the body in balance. When a certain stimulus triggers the nervous system, it responds with an appropriate reaction. This cannot occur without a receptor site awaiting the stimulus. These receptor sites are made of protein complexes and are responsible for transmitting nerve messages from cell to cell.

viii) Fluid Balance:

Proteins have the unique ability to regulate the amount of fluid within a cell. The amount of protein within a cell will determine the cell's water content, as water is attracted to protein. When protein levels are low, fluid imbalances result. This type of system is important to prevent dehydration, as well as to enhance muscle and nerve cell function.

Describe the significance of milk proteins.

Milk on dry basis is a rich source of proteins (26%). Fresh milk contains only 3.5% proteins due to its high water content. Milk proteins are rich in all essential amino acids except S-amino acid, in which they are limiting to a small extent.

Describe the significance of protein from legumes.

Common legumes are rich source of proteins containing 18 to 25%. Soyabean is very rich containing from 30 to 40% proteins. Legume proteins are good sources of lysine and threonine in which cereals are deficient but legume proteins are limiting in sulphur amino acids and tryptophan, which are present in good amounts in cereal proteins.

Give the Biological Value (BV) of proteins.

Biological value is an index of protein quality. It is defined as the amount of absorbed nitrogen retained in the body. The digestibility factor is not taken into account. Biological value (BV) is a

quantitative measure of the nutritive value of a protein food. A protein of high BV will retain more nitrogen than a protein of low BV.

Cereals and pulses consumed together will have a higher BV than the average value of the individual cereal or pulse. This is because of the complementary nature of proteins. Amino acids deficient in cereals will be compensated by the amino acids present in pulses.

The perfect protein has a BV of 100.

Biological value of some common foods:

Food	Biological value	Food	Biological value
Egg	100	Rice	73
Milk	85	Wheat	66
Fish	83	Groundnuts	55
Meat	75	Gelatin	00

What does the biological value of proteins suggest?

In 1925 Mitchell developed the protein determining method. This method measures the amount of dietary proteins utilized by the animal to meet the protein needs of its body.

In this method two groups of 28 day old rats are fed on two different diets. One on protein free diet and other on 10 percent test protein. Food intake is recorded. The urine, faeces are collected and analyzed for nitrogen. The dietary nitrogen is also estimated. From these records the following calculations are made,

$$\text{Nitrogen Digested} = \text{Nitrogen Intake (I}_n) - \text{Nitrogen in faeces on protein diet (F}_n) + \text{Nitrogen faeces on protein free diet (F}_e).$$

$$\text{i.e. Nitrogen Digested} = I_n - (F_n - F_e)$$

$$\text{Nitrogen lost in Metabolism} = \text{Nitrogen in urine on protein diet (U}_n) - \text{Nitrogen in urine on protein free diet (U}_e).$$

$$\text{Biological Value} = \frac{100 \times \text{Nitrogen digested} - \text{Nitrogen lost in metabolism}}{\text{Nitrogen digested}}$$

$$\text{Biological Value} = \frac{I_n - (F_n - F_e) - (U_n - U_e)}{I_n - (F_n - F_e)} \times 100$$

What is the protein efficiency ratio?

In 1919 Osborne, Mendel and Ferry developed this method. This method is based on growth of young rats. A 10 % of test protein diet with all other dietary essentials is fed to the rats for four weeks. The Gain in body weight and protein intake of rats is recorded. Then the protein efficiency ratio is calculated using the following formula,

$$\text{PER} = \frac{\text{Gain body weight in gm}}{\text{Protein intake in gm}} = \text{Gain in weight/gm of protein consumed}$$

Unit - 3

Fats and Oils; Vitamins and Minerals

FATS AND OILS:

Composition and Sources:

Fats and oils are mainly serve as the source of energy and they contain some essential nutrients like essential fatty acids and fat soluble vitamins. Fat is essential for maintaining good health as absence of fat leads to the development of a deficiency disease affecting the skin.

Sources:

i) Plant sources: Vegetable fats are good sources of essential fatty acids. Sunflower, safflower sesame, soyabean and cottonseed oils are rich source of essential fatty acids. They are also good sources of vitamin E, Vanaspati (hydrogenated vegetable oil) is a good source of vitamin A and fair source of vitamin E and essential fatty acids.

All oils and oilseeds like groundnuts, sesame, soya bean, rice bran, coconut, almond, cashew nut, corn, safflower, sunflower etc and all hydrogenated fats and margarine are sources of fats.

ii) Animal sources: They are poor sources of vitamin E and essential fatty acids. They also contain cholesterol.

Mutton, pork, fish, poultry, milk and milk products such as butter, cream, cheese, eggs and organ meat are sources of fats.

iii) Invisible sources: Invisible sources of fats are nuts, salad dressings, flesh food, desserts, cookies, cakes, milk, eggs, milk based sweetmeats etc. which are rich in fat, but the fat is not visible.

Nutritional value/ energy value / fuel value of Fats and Oils:

Fats and fat products serve mainly as a source of energy. They are also important sources of essential fatty acids and vitamin A and vitamin E.

Nutritional value/ energy value / fuel value of Fats and Oils:

Name of Fat	Fat %	Calorific value Kcal/100 g	Vitamin A (ug/100g)	Vitamin E (mg/100g)
Fats of Animal Origin :				
Butter	86	774	700	2.4
Ghee	100	900	600	2.0
Animal body fats	100	900	---	1.0 - 2.0
Fats of Vegetable Origin :				
Vegetable oils and fats	100	900	---	8 – 140
Red palm oil	100	900	400 – 10000	10 - 15
Processed Fats :				
Margarine	86	774	700	10 - 50
Shortenings	100	900	---	10 - 50
Vanaspati	100	900	700	10 - 30

Required daily allowances of Fats and Oils:

The recommendation of the of fats by I.C.M.R. Nutrition Expert Group (1968) are, Adults 10 %, Adolescents 15 %, Children (1-11 yrs) 15%, and Infants (0-1 year) 30% of total calories in the food from fat.

Group	Particulars	Body weight (kg)	Fat (g/day)
Man	Adult	60	20
Woman	Adult	50	20
	Pregnant	50	30
	Lactation	50	45
Children	1 – 9 years	12.2 - 26.9	25
Boys Girls	10-12 years	35.4	22
		31.5	
Boys Girls	13-15 years	47.8	22
		46.7	
Boys Girls	16-18 years	57.1	22
		49.9	

Deficiency and excess intake diseases of fats and Oils:

Deficiency Diseases:

- i) Deficiency of fat causes a deficiency of essential fatty acids like linoleic and linolenic acids and subsequently a deficiency of arachidonic acid. These polysaturated fatty acids are required for healthy cell membranes and their permeability. A deficiency results in characteristic eczema and skin lesions. It is seen in infants as dry scaly lesions on the skin. Toad skin or dry popules are seen in upper limbs.
- ii) A deficiency of fat may result deficiency of fat soluble vitamins and growth and weight may be affected in children.
- iii) Deficiency essential fatty acid causes a nutritional deficiency of the skin, Phrynoderma.

Excess intake Diseases:

- i) Excess of fat consumption amounting to over 40% of the dietary calories has been associated with hypercholesterolemia and atherosclerosis.
- ii) Excess intake of fat causes obesity because more Kcal are consumed than required by the body. Excess fat is stored in adipose tissue.
- iii) Excessive consumption of saturated fats elevates blood cholesterol levels. A high intake of saturated fat and cholesterol are predisposing factors for cardiovascular diseases while foods rich in omega-3 fatty acids have a protective effect.

Functions of Fats and oils:

Fats perform several important functions.

- 1) **Energy:** They are the concentrated source of energy, yielding more than twice the energy supplied by carbohydrate per unit weight. All tissues except those of the central nervous system and brain can utilize fat as a source of energy.
- 2) **Protein sparing action:** The kilocalories from the fat spare dietary proteins from being oxidized for energy. An adequate intake of fat in the diet allows proteins to perform their main functions of growth and maintenance.
- 3) **Thermal insulation:** Subcutaneous fat acts as an insulation and helps in retaining body heat.
- 4) **Protection of vital organs:** Fat provides a protective padding to vital organs from mechanical shock and keeps them in place.
- 5) **Absorption of fat soluble vitamins:** Fat is necessary for the absorption of fat soluble vitamins A, D, E and K.
- 6) **Essential fatty acids:** An adequate intake of fats/oils is necessary to meet the body's requirements for linoleic and linolenic acids.
- 7) **Satiety value:** Fats slow down the secretion of gastric juice and speed up digestion.
- 8) **Flavour:** Food is more flavoursome because of volatile essential oils naturally present and fats used for cooking. A well cooked meal containing fats is more satisfying than a meal devoid of fats.
- 9) **Synthesis of cell membranes:** Fats are an important constituent of all cell membranes.
- 10) **Synthesis of hormones:** The lipid cholesterol is necessary for the synthesis of some hormones. Exa. – Sex hormones.

Anti-nutritional factors:

Anti-nutritional factors are natural or synthetic substances found in the human diet or animal feed that have the potential to adversely affect health and growth by preventing the absorption of nutrients from food.

Excessive intake of required nutrients can also result in them having an anti-nutrient action.

Biological effect of Antioxidants:

Antioxidants are compounds that prevent oxidation. Oxidation is the process that turns newspaper yellow and cut apples brown. Oxidation leads to degenerative changes in our body. Exa. – It contributes to the breakdown of body cells as we age.

Antioxidants such as vit. C, vit. E, beta-carotene and selenium help protect against free radical damage. They scavenge free radicals and protect body cells against cancer. They prevent atherosclerosis and coronary artery diseases (CAD).

VITAMINS:

Composition and Sources:

Szent Gyogi says that, a vitamin is something that makes us sick when we do not eat it. Vitamins are defined as, potent organic compounds, occurring in varying and minute proportions in food, which must be available to the organism from exogenous sources, in order that physiological processes essential to life may proceed normally.

Vitamins are natural substances found in plants and animals and known as Essential nutrients for human beings. Dr. Funk introduced the term vitamine for these organic compounds. The vitamin which Funk extracted contained as amine and that is found to be essential for vital activities. Hence the name Vitamine. But later it was found that amine was not present in all the vitamins. Hence 'e' was deleted and the term Vitamin was used instead of Vitamine.

Vitamins are low molecular weight organic compounds indispensable for the normal vital activity of the organisms. Their absence causes deficiency diseases.

Vitamins either participate in the production of coenzymes, indispensable for normal functioning or the corresponding enzymes or act as regulators or biochemical processes.

Sources of Vitamins:

Plants synthesize all vitamins, animals cannot synthesize all vitamins. But vitamins are present in animals as a result of food intake. In humans the vitamin sources are food and intestinal bacteria.

Human body uses these substances to stay healthy and support its many functions.

The body needs vitamins to stay healthy and a varied diet usually gives you all the vitamins you need. Vitamins do not provide energy (calories) directly, but they do help regulate energy-producing processes.

There are two types of Vitamins –

- i) Fat soluble vitamins such as Vit. A, D, E and K.
- ii) Water soluble vitamins such as Vit. B₁, Riboflavin, Vit. B₆, Niacin, Panthothenic acid, Folic acid, Vit. C etc.

Vitamin A (retinol) properties	
Good for	Eyesight, growth, appetite and taste.
Signs of deficiency	Night-blindness
RDA	800 micrograms
Good sources	Liver, cod liver oil, carrots, green leafy vegetables, egg yolks, enriched margarine, milk products and yellow fruits.
Poisoning	This vitamin is fat-soluble and so is stored in the body for a long time, especially in pregnancy. An overdose may be dangerous.
Destroyed by	Fatty acids

Vitamin B1 (thiamine) properties	
Good for	Nervous system, digestion, muscles, heart, alcohol-damaged nerve tissues.
Signs of deficiency	Tingling in fingers and toes, confusion, difficulties in maintaining balance, loss of appetite, exhaustion and weakened powers of concentration.
RDA	1.4 mg
Good sources	Liver, yeast, egg yolk, cereal, red meat, nuts and wheatgerm
Poisoning	No danger. It dissolves in water, so any excess is passed in urine.
Destroyed by	High temperatures, alcohol and coffee
Vitamin B2 (riboflavin) properties	
Good for	Growth, skin, nails, hair, sensitive lips and tongue, eyesight, the breakdown of protein, fat and carbohydrates
Signs of deficiency	Itchy irritated eyes, itchy mucous membranes (nose, mouth, throat) and cracked corners of lips.
RDA	1.6 mg
Good sources	Milk, liver, yeast, cheese, green leafy vegetables, fish
Poisoning	No danger. It dissolves in water, so any excess is passed in urine.
Destroyed by	Alcohol and light (this is why milk-cartons are better than bottles).
Vitamin B6 (pyridoxine) properties	
Good for	Preventing skin conditions, nerve problems, helps the body absorb protein and carbohydrate.
Signs of deficiency	Skin inflammation.
RDA	2 mg – women taking the contraceptive pill may need more.
Good sources	Fish, bananas, chicken, pork, wholegrains and dried beans
Poisoning	May cause nerve problems in large doses. Evidence is conflicting about the maximum safe dose, so get medical advice before exceeding the RDA.
Destroyed by	The contraceptive pill, roasted or boiled food, alcohol and oestrogen (the female hormone).
Vitamin B12 (Cobalamin) properties	
Good for	Making red blood and the formation of the nerves
Signs of deficiency	Tiredness and fatigue, tingling and numbness in hands/feet, memory problems and anaemia
RDA	1 microgram
Good sources	Eggs, shellfish, poultry, meat, liver, milk, cheese and fortified cereal
Poisoning	No danger. It dissolves in water, so any excess is passed in urine.
Destroyed by	Water, sunlight, alcohol, oestrogen and sleeping pills
Vitamin C (ascorbic acid) properties	
Good for	Immune defence system, protection from viruses and bacteria, healing wounds, reducing cholesterol, cell lifespan and preventing scurvy
Signs of deficiency	Tiredness, bleeding gums and slow-healing wounds
RDA	60 mg
Good sources	Citrus fruits, kiwi fruit, berries, tomatoes, cauliflower, potatoes, green leafy vegetables and peppers
Poisoning	Large doses can cause diarrhoea and nausea, eg 2g/day . Some scientists have argued that 1000-5000mg per day may damage your DNA.
Destroyed by	Boiling food, light, smoking and heat.

Vitamin D properties	
Good for	Strong bones and teeth
Signs of deficiency	Unhealthy teeth, osteomalacia (causes weakening of bones), rickets in children.
RDA	5 micrograms
Good sources	Sunlight (the action of sunlight on the skin allows our bodies to manufacture vitamin D), cod liver oil, sardines, herring, salmon, tuna, milk and milk products.
Poisoning	This vitamin is fat-soluble so can accumulate in the body. Overdoses are dangerous, but there is wide variability in the toxic level, eg 400IU for children.
Destroyed by	Mineral oil.
Vitamin E (Tocopherol) properties	
Good for	Fighting toxins – vitamin E is a powerful antioxidant.
Signs of deficiency	Weak muscles and fertility problems
RDA	10 mg
Good sources	Nuts, soya beans, vegetable oil, broccoli, sprouts, spinach, wholemeal products and eggs
Poisoning	Potential effect with warfarin increasing risk of bleeding, more than 400IU/day can increase risk of heart failure and death in long term illness.
Destroyed by	Heat, oxygen, frost, iron and chlorine
Folic acid properties	
Good for	Production of red blood cells. It is essential in the first three months of pregnancy to prevent birth defects such as spina bifida, cleft palate or cleft lip.
Signs of deficiency	Tiredness due to anaemia and red tongue
RDA	200 micrograms. Women planning to conceive should take a daily supplement of 400 mcg, continued for the first 12 weeks of pregnancy
Good sources	Carrots, yeast, liver, egg, yolks, melon, apricots, pumpkin, avocado, beans, rye and whole wheat and green leafy vegetables
Poisoning	No danger. It dissolves in water, so any excess is passed in urine
Destroyed by	Water, sunlight and heat

List of Vitamins with Chemical name, Food source, Recommended dietary allowances (RDA), Deficiency disease and Overdose disease:

Name of Vitamin	Chemical name of Vitamin	Food Source	RDA Male: Age 19-70)	Deficiency disease	Overdose disease
Fat Soluble Vitamins:					
Vitamin A	Retinol, retinal and four carotenoids including beta carotene	Cod liver oil	900 ug	Night-blindness, Hyperkeratosis, and Keratomalacia	Hypervitaminosis A
Vitamin D	Cholecalciferol	Cod liver oil	5 – 10 ug	Rickets and Osteomalacia	Hypervitaminosis D

Vitamin E	Tocopherols, tocotrienols	Wheat germ oil, unrefined vegetable oils	15 mg	Deficiency is very rare; mild hemolytic anemia in newborn infants	Increased congestive heart failure seen in onelarge randomized study
Vitamin K	Phylloquinone, menaquinones	Leafy green vegetables	120 ug	Bleeding diathesis	Increases coagulation in patients taking warfarin
Water Soluble Vitamins:					
Vitamin C	Ascorbic acid	Citrus, most fresh foods	90 mg	Scurvy	Vitamin C megadosage
Vitamin B1	Thiamine	Rice bran	1.2 mg	Beriberi, Wernicke-Korsakoff syndrome	Drowsiness or muscle relaxation with large doses
Vitamin B2	Riboflavin	Meat, eggs	1.3 mg	Ariboflavinosis	
Vitamin B3	Niacin, niacinamide	Meat, eggs, grains	16 mg	Pellagra	Liver damage (doses > 2g/day) and other problems
Vitamin B5	Pantothenic acid	Meat, whole grains, in many foods	5 mg	Paresthesia	Diarrhea; possibly nausea and heartburn.
Vitamin B6	Pyridoxine, pyridoxamine, pyridoxal	Meat, dairy products	1.3 to 1.7 mg	Anemia peripheral neuropathy	Impairment of proprioception, nerve damage (doses > 100 mg/day)
Vitamin B7	Biotin	Meat, dairy products, eggs	30 ug	Dermatitis, enteritis	
Vitamin B9	Folic acid, folinic acid	Leafy green vegetables	400 ug	Megaloblast and Deficiency during pregnancy is associated with birth defects, such as neural tube defects	May mask symptoms of vitamin B12 deficiency; other effects
Vitamin B12	Cyanocobalamin, hydroxycobalamin, methylcobalamin	liver, eggs, animal products	2.4 ug	Megaloblastic anemia	Acne-like rash [causality is not conclusively established]

Functions of Vitamins:

Vitamins promote normal growth, provide proper metabolism, ensure good health and protect against certain diseases. Vitamin is required by the body in small amounts for metabolism, to protect health and for proper growth in children. Vitamins assist in the formation of hormones, blood cells, nervous-system chemicals, and genetic material. Vitamins mainly serve as catalysts for certain reactions in the body. They combine with proteins to create metabolically active enzymes that in turn produce hundreds of important chemical reactions throughout the body. The fundamentals of cells depend greatly upon vitamins. Vitamins are responsible for keeping cells strong, binding tissues, fighting infections, etc. Without vitamins our cells would not function properly and thus our organs would suffer and eventually we would no longer be able to survive. Vitamins help regulate metabolism, help convert fat and carbohydrates into energy, and assist in forming bone and tissue.

- i) Vitamin A plays an important role in vision, bone growth, reproduction, cell division and differentiation.
- ii) Vitamin B complex improves the body's resistance to stress. Aids in digestion, promotes good muscle tone, healthy skin. Vitamin B complex reduces muscle spasms, leg cramps, hand numbness and helps regulate blood pressure.
- iii) Vitamin C is responsible for helping to build and maintain our tissues and strengthening our immune system.
- iv) Adequate amounts of vitamin D is necessary for preventing bone loss.
- v) Vitamin E is the most effective, fat-soluble antioxidant known to occur in the human body. The main function of vitamin E is to maintain the integrity of the body's intracellular membrane by protecting its physical stability and providing a defense line against tissue damage caused by oxidation. Alpha-lipoic acid helps to neutralize the effects of free radicals on the body.
- vi) Vitamin K plays an important role in blood clotting and bone metabolism (carboxylation of osteocalcin). Bioflavonoids have antioxidant, anti-inflammatory, anti-allergenic, antiviral, and anti-carcinogenic properties.

Vitamins as accessory factor of food:

In 1906, English biochemist Sir F. G. Hopkins was first called vitamin as accessory factor of food. Because he was found that, most foods contain besides carbohydrates, proteins, fats, minerals and water, other substances necessary for health.

Vitamin is a group of organic substances that are required in the diet of humans and animals for normal growth, maintenance of life and normal reproduction. Vitamins act as catalysts; very often either the vitamins themselves are coenzymes or they form integral parts of coenzymes. A

substance that functions as a vitamin for one species does not necessarily function as a vitamin for another species. The vitamins differ in structure and there is no chemical grouping common to them all.

Vitamins have diverse biochemical functions. Some have hormone-like functions as regulators of mineral metabolism such as vitamin D or regulators of cell and tissue growth and differentiation such as some forms of vitamin A. Others function as antioxidants e.g., vitamin E and sometimes vitamin C. The large number of vitamins, such as B complex vitamins functions as precursors for enzyme cofactors, which help enzymes in their work as catalysts in metabolism. In this role, vitamins may be tightly bound to enzymes as part of prosthetic groups, for e.g. biotin is part of enzymes involved in making fatty acids.

Vitamins may also be less tightly bound to enzyme catalysts as coenzymes, detachable molecules that function to carry chemical groups or electrons between molecules, for e.g. folic acid may carry methyl, formyl and methylene groups in the cell. Although these roles in assisting enzyme-substrate reactions are vitamins best-known function, the other vitamin functions are equally important.

Note : The recommended amounts of these vitamins are listed in three different ways: grams, milligrams and micrograms.

Vitamin	Examples of Good Food Sources	Function	Recommended Daily Amount (RDA) or Adequate	Upper Limit (The Highest Amount You Can Take Without Risk)
Vitamin A	Sweet potato with peel, carrots, spinach, fortified cereals	Necessary for normal vision, immune function, reproduction	Men: 900 ug/day Women: 700 ug/day	3,000 ug/day
Vitamin B₁(Thiamin)	Whole grain, enriched, fortified products; bread; cereals	Allows the body to process carbohydrates and some protein.	Men: 1.2 mg/day Women: 1.1 mg/day Pregnant and breastfeeding women: 1.4 mg/day	Unknown
Vitamin B₂ (Riboflavin)	Milk, bread products, fortified cereals	Key in metabolism and the conversion of food into energy; helps produce red blood cells	Men: 1.3 mg/day Women: 1.1 mg/day Pregnant Women: 1.4 mg/day Breastfeeding Women: 1.6 mg/day	Unknown
Vitamin B₃ (Niacin)	Meat, fish, poultry, enriched and whole grain breads, fortified cereals	Assists in digestion and the conversion of food into energy; important in the	Men: 16 mg/day Women: 14 mg/day Pregnant Women: 18 mg/day Breastfeeding	For niacin in natural sources, there is no upper limit. For niacin in supplements or

		production of cholesterol	women: 17 mg/day	fortified foods: 35 mg/day
Vitamin B₅ (Pantothenic Acid)	Chicken, beef, potatoes, oats, cereals, tomatoes	Important in fatty acid metabolism	Adults: 5 mg/day Pregnant women: 6 mg/day Breastfeeding women: 7 mg/day	Unknown
Vitamin B₆	Fortified cereals, fortified soy products, organ meats	Important for the nervous system; helps the body metabolize proteins and sugar	Men age 19-50: 1.3 mg/day Men age 51 up: 1.7 mg/day Women age 19 - 50: 1.3 mg/day Women age 51 up: 1.5 mg/day Pregnant women: 1.9 mg/day Breastfeeding women: 2 mg/day	100 mg/day
Vitamin B₇(Biotin)	Liver, fruits, meats	Helps with the synthesis of fats, glycogen and amino acids	Adults: 30 ug/day Breastfeeding women: 35 ug/day	Unknown
Vitamin B₁₂ (Cobalamin)	Fish, poultry, meat, fortified cereals	Important in the production of red blood cells	Adults: 2.4 ug/day Pregnant women: 2.6 ug/day Breastfeeding women: 2.8 ug/day	Unknown
Vitamin C	Red and green peppers, kiwis, oranges, strawberries, broccoli	Antioxidant that protects against cell damage, boosts the immune system, forms collagen in the body	Men: 90 mg/day Women: 75 mg/day Pregnant women: 85 mg/day Breastfeeding women: 120 mg/day	2,000 mg/day
Vitamin D (Calciferol)	Fish liver oils, fatty fish, fortified milk products, fortified cereals; also, formed naturally as a result of sunlight exposure	Crucial in metabolizing calcium for healthy bones	Adults age 18-50: 5 ug/day Adults age 51-70: 10 ug/day Adults over age 70: 15 ug/day Pregnant and breastfeeding women: 5 ug/day	50 ug/day
Vitamin E (alpha-	Fortified cereals, sunflower seeds,	Antioxidant that protects cells	Adults (including pregnant	1,000 mg/day

tocopherol)	almonds, peanut butter, vegetable oils	against damage	women): 15 mg/day Breastfeeding women: 19 mg/day	
Vitamin K	Green vegetables like spinach, collards, and broccoli; brussels sprouts; cabbage	Important in blood clotting and bone health	Men: 120 ug/day Women (including pregnant and breastfeeding): 90 ug/day	Unknown

MINERALS:

Composition and Sources:

The body contains about 24 minerals all of which are derived from the diet. The important minerals are calcium, phosphorous, potassium, sodium, chloride, magnesium, iron, copper, iodine, fluorine and zinc.

The body needs many minerals; these are called essential minerals. Essential minerals are divided into major minerals (macrominerals) and trace minerals (microminerals). These two groups of minerals are equally important, but trace minerals are needed in smaller amounts than major minerals.

Macrominerals or Major minerals: These are Sodium, Chloride, Potassium, Calcium, Phosphorus, Magnesium and Sulfur

Microminerals or Trace minerals: These are Iron, Zinc, Iodine, Selenium, Copper, Manganese, Fluoride, Chromium and Molybdenum. Other trace nutrients known to be essential in tiny amounts include nickel, silicon, vanadium, and cobalt.

Sources, Nutritional value / energy value / fuel Value, Required daily allowances, Deficiency and excess intake disease and Functions of Minerals:

1) Calcium:

Calcium is essential for bone growth and strength, as well as muscle, heart and digestive system health. Sources of the mineral include dairy products, green leafy vegetables and sardines eaten with bones, nuts and seeds.

Sources: Dairy products such as milk, yoghurt and cheese, kelp, broccoli, almonds, sardines eaten with the bones and sesame seeds.

RDA: The recommended daily amount (RDA) is 1000 mg.

Function: Calcium is a macromineral that is needed to maintain strong and healthy bones and teeth. It is also involved in normal blood clotting, muscle and nerve function, lowering blood pressure and is thought to prevent colon cancer.

Symptoms of deficiency: Muscle weakness, spasms and cramp, softening of the bones, which could lead to osteoporosis, back pain, brittle bones and fractures.

2) Chloride:

Chloride is a necessary mineral for digestive health. It helps in the production of hydrochloric acid in the stomach and cellular pump functions. It can be found in table salt.

Sources: Table salt and foods that contain sodium chloride.

Function: Required for the formation of acids in the stomach as well as regulating fluid in all blood vessels and cells.

RDA: The RDA is 2300 mg.

Symptoms of deficiency: A deficiency is very uncommon but may cause excessive amounts of potassium to be lost and low blood pressure.

3) Magnesium:

Magnesium is necessary for processing enzymes important for metabolism, especially in bones, muscles, and soft tissue. Foods with magnesium include nuts, soy beans, and cocoa.

Sources: Whole grains, green leafy vegetables, shellfish, nuts and bananas.

RDA: The RDA is 420 mg.

Function: A very important macromineral that is contained in our bones. It is needed to convert blood sugar into energy, control muscle and nerve function, maintain a normal heart rhythm and blood clotting. Research has proved that magnesium protects and treats heart disease, lowers high blood pressure, can ease asthma attacks and PMS in women.

Symptoms of deficiency: The risk of heart disease and diabetes is increased and can also cause heartbeat irregularities, confusion, muscle cramps and kidney stones.

4) Phosphorous:

Phosphorous is required for bone health, energy processing, and many other functions in the body. Foods rich in phosphorous are meat, poultry, fish, eggs, and dairy products.

Sources: meat, poultry, fish, milk, cheese, nuts, seeds and whole grains.

RDA: The RDA for phosphorous is 700 mg.

Function: Phosphorous is another important mineral involved in the formation and maintenance of strong and healthy bones and teeth. It also helps to supply energy to every cell in the body and is needed to absorb a number of vitamins.

Symptoms of deficiency: A deficiency in phosphorous is fairly rare, however, symptoms would include weak and painful bones and teeth, stiff joints, tiredness and a loss of calcium from the body.

5) Potassium:

Potassium is needed for regulating how the body processes energy and maintains metabolism, as well as contributing to nerve function. Foods high in potassium include legumes, potato skins, tomatoes, and bananas.

Sources: Fresh fruit and vegetables, particularly avocados, bananas, oranges, potatoes. Also dried fruit, nuts, seeds, meat, poultry and milk.

RDA: The RDA for potassium is 4700 mg.

Function: Potassium, along with sodium, works to regulate fluid in the body. Potassium also helps to maintain a regular heartbeat and low blood pressure and enables glucose in the body to be converted to glycogen, a storable form of energy.

Symptoms of deficiency: Muscle weakness, nausea, confusion and feelings of being really thirsty.

6) Sodium:

Sodium is necessary for regulating body fluid, nerve function, and heart health. Foods with sodium are table salt, sea vegetables, milk, and spinach.

Sources: Salt, shellfish, anchovies, dairy products especially butter, yeast extracts, processed meats, avocados and offal.

RDA: The RDA for sodium is 1500 mg.

Function: Helps to maintain muscles and nerves in good working order and works together with potassium, regulating the fluids in the body.

Symptoms of deficiency: A deficiency is very rare but is possible through sweating, diarrhoea or vomiting and symptoms include sickness and dizziness, muscle cramps and dehydration.

7) Chromium:

Sources: Shellfish, red meat, liver, egg yolks, cheese, molasses, brewer's yeast, mushrooms and whole wheat bread.

RDA: The RDA is 35 – 40 ug/day

Function: Chromium is a trace element that is important in the body. It is able to stabilise blood sugar levels, which could prevent diabetes, by using insulin efficiently. It also aids the break down of fats in the body and is said to increase the good cholesterol in the body while lowering the bad cholesterol.

Symptoms of deficiency: A lack of chromium could bring on the onset of diabetes as well as raise blood cholesterol levels and could lead to heart disease.

8) Copper:

Copper is necessary for the metabolism of iron. Foods that contain this mineral are seafood, nuts, seeds, wheat bran cereals, and whole grains.

Sources: Offal, oysters and shellfish, whole grains, nuts, seeds, avocados, potatoes, garlic, bananas, mushrooms, cocoa, tomatoes, prunes and soya products.

RDA: The RDA is 900 mg.

Function: Copper helps to form collagen, which is essential for healthy bones and connective tissue. It is important for the production of red blood cells and is needed to absorb iron more easily. Research suggests that copper may prevent heart disease and high blood pressure and that it protects against damage from free radicals and the development of cancer.

Symptoms of deficiency: Weakness, skin and breathing problems, although a deficiency is not common.

9) Fluoride:

Sources: Toothpaste, tap water and tea.

RDA: The RDA is 3 - 4 mg/day.

Function: Fluoride is important for healthy bones and teeth and protects teeth against tooth decay.

Symptoms of deficiency: A lack of fluoride will cause tooth decay.

10) Iodine:

Iodine is required for maintaining the production of thyroid hormones, regulating metabolism, and may also work as an antioxidant. Foods that have iodine are iodized salt, seafood, or some processed foods with iodized salt.

Sources: Table salt, seafood, saltwater fish and seaweed.

RDA: The RDA for iodine is 150 mg.

Function: Iodine plays a major part in the manufacture of certain hormones by the thyroid gland, that are responsible for regulating metabolism, converting fats into energy and stabilizing blood cholesterol levels.

Symptoms of deficiency: This is extremely rare but a deficiency would lead to an enlarged thyroid gland, dry skin and tiredness.

11) Iron:

Iron is essential for the production of hemoglobin, the protein which transports oxygen in red blood cells. The mineral is necessary to prevent anemia. Foods with iron include red meat, leafy green vegetables, fish such as tuna or salmon, eggs, dried fruits, beans, whole grains, and enriched grains.

Sources: Liver, lamb, beef, oysters, shellfish, clams, mussels, beans, peas, yeast, dried fruits, fortified breakfast cereals, molasses, wheat bran and green leafy vegetables.

RDA: The FDA for iron is 8 mg.

Function: Iron is required for the production of haemoglobin, the component of red blood cells that transports oxygen around the body. It is also needed to produce myoglobin, which carries oxygen to our muscles. Iron can prevent fatigue, protect against illness and disease and promotes a healthy looking skin.

Symptoms of deficiency: It is not uncommon for people to have an iron deficiency in their diet. This could be the case particularly for women with heavy periods, vegetarians and athletes. Symptoms of a lack of iron include tiredness and fatigue, poor concentration, prone to infection, shortness of breath, anaemia, brittle hair and heart palpitations.

12) Manganese:

Manganese is essential for enzyme functions that maintain metabolism and proper digestion. It can also protect the body against free radicals. Foods containing the mineral are whole grains, nuts, and green vegetables.

Sources: Nuts, brown rice, cereals, whole grains and pulses.

RDA: The RDA for manganese is 2.3 mg.

Function: Manganese is important for the protection of the body's cells particularly against damage from free radicals. It is required for the process of metabolism and digestion and helps to break down fats and cholesterol. Manganese is also vital for the formation of healthy bones and tissues.

Symptoms of deficiency: A lack of manganese can lead to digestive problems, dizziness and loss of hearing.

13) Molybdenum:

Molybdenum is necessary for producing DNA and works as an antioxidant by helping in the prevention of allergic reactions. Foods rich in molybdenum include liver, whole grains, yeast, and leafy green vegetables.

Sources: Liver, whole grains, yeast, pulses, leafy green vegetables.

RDA: The RDA is 45 mg.

Function: Necessary for the production of DNA and is also known as an antioxidant. It helps to break down sulfites in foods, where if a toxic build-up occurs, it could lead to an allergic reaction. It is also known to prevent tooth decay.

Symptoms of deficiency: A deficiency could lead to breathing difficulties and other allergic reactions.

14) Selenium:

Selenium is essential for the function of antioxidant enzymes that combat free radicals. It is important for fighting against diseases such as cancer and heart disease. Foods with selenium include seafood, eggs, dairy products, citrus fruits, nuts, avocados, and lentils.

Sources: Seafood, eggs, offal, dairy products, citrus fruits, brazil nuts, avocados and lentils.

RDA: The RDA for selenium is 55 mg.

Function: Selenium is an important antioxidant, as it is known to block free radicals in the body. It fights cancer, heart disease and prevents cataracts from forming. It may delay the development

of AIDS and reduces the severity of common infections and illnesses.

Symptoms of deficiency: A lack of selenium in the diet could lead to a higher risk of cancer, heart disease and skin problems.

15) Sulphur:

Sources: Animal and vegetable proteins such as meat, poultry, beans and pulses and shellfish.

Function: Sulphur is an important component of several amino acids, which are needed to form proteins in the body. It is also very good at detoxifying and eliminating any toxins from the body. Sulphur may delay the ageing process and the onset of any age-related diseases.

16) Zinc:

Zinc is required for maintaining the immune system, reproductive health, and normal growth. Foods with zinc include seafood, red meat, poultry, fish, and eggs.

Sources: Oysters, red meat, poultry, eggs, shellfish, cheese, nuts, sunflower seeds, beans and wheat germ.

RDA: The RDA for zinc is 11 mg.

Function : Zinc is present in every cell in the body and also in hair, nails and skin. It is needed to maintain a healthy immune system, which can help in keeping colds and flu at bay. Zinc is necessary for a healthy reproduction system, normal growth and can also be taken to treat a number of problems such as fatigue, skin problems and sore throat.

Symptoms of deficiency: A lack of zinc in the diet is quite uncommon, however, symptoms include more cold and flu bouts, longer healing of wounds, a lesser sense of taste and smell, skin problems, loss of appetite and night blindness.

Macrominerals or Major minerals:

Mineral	Sources	Function
Sodium	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, breads, vegetables, and unprocessed meats	Needed for proper fluid balance, nerve transmission, and muscle contraction
Chloride	Table salt, soy sauce; large amounts in processed foods; small amounts in milk, meats, breads, and vegetables	Needed for proper fluid balance, stomach acid
Potassium	Meats, milk, fresh fruits and vegetables, whole grains, legumes	Needed for proper fluid balance, nerve transmission, and muscle contraction
Calcium	Milk and milk products; canned fish with bones (salmon, sardines); fortified tofu and fortified soy milk; greens (broccoli, mustard greens); legumes	Important for healthy bones and teeth; helps muscles relax and contract; important in nerve functioning, blood clotting, blood pressure regulation,

		immune system health
Phosphorus	Meat, fish, poultry, eggs, milk, processed foods (including soda pop)	Important for healthy bones and teeth; found in every cell; part of the system that maintains acid-base balance
Magnesium	Nuts and seeds; legumes; leafy, green vegetables; seafood; chocolate; artichokes; "hard" drinking water	Found in bones; needed for making protein, muscle contraction, nerve transmission, immune system health
Sulfur	Occurs in foods as part of protein: meats, poultry, fish, eggs, milk, legumes, nuts	Found in protein molecules

Microminerals or Trace minerals:

Mineral	Sources	Function
Iron	Organ meats; red meats; fish; poultry; shellfish (especially clams); egg yolks; legumes; dried fruits; dark, leafy greens; iron-enriched breads and cereals; and fortified cereals	Part of a molecule (hemoglobin) found in red blood cells that carries oxygen in the body; needed for energy metabolism
Zinc	Meats, fish, poultry, leavened whole grains, vegetables	Part of many enzymes; needed for making protein and genetic material; has a function in taste perception, wound healing, normal fetal development, production of sperm, normal growth and sexual maturation, immune system health
Iodine	Seafood, foods grown in iodine-rich soil, iodized salt, bread, dairy products	Found in thyroid hormone, which helps regulate growth, development, and metabolism
Selenium	Meats, seafood, grains	Antioxidant
Copper	Legumes, nuts and seeds, whole grains, organ meats, drinking water	Part of many enzymes; needed for iron metabolism
Manganese	Widespread in foods, especially plant foods	Part of many enzymes
Fluoride	Drinking water (either fluoridated or naturally containing fluoride), fish, and most teas	Involved in formation of bones and teeth; helps prevent tooth decay
Chromium	Unrefined foods, especially liver, brewer's yeast, whole grains, nuts, cheeses	Works closely with insulin to regulate blood sugar (glucose) levels
Molybdenum	Legumes; breads and grains; leafy	Part of some enzymes

greens; leafy, green vegetables; milk; liver
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Other trace nutrients known to be essential in tiny amounts include nickel, silicon, vanadium, and cobalt.

Note : The recommended amounts of these minerals are listed in three different ways: grams, milligrams and micrograms.

Mineral	Examples of Good Food Sources	Function	Recommended Daily Amount (RDA) or Adequate	Upper Limit (The Highest Amount You Can Take Without Risk)
Calcium	Milk, yogurt, hard cheeses, fortified cereals, spinach	Essential for bone growth and strength, blood clotting, muscle contraction, and the transmission of nerve signals	Adults age 19-50: 1,000 mg/day Adults age 51 and up: 1,200 mg/day	2,500 mg/day
Choline (Vitamin B complex)	Milk, liver, eggs, peanuts	Plays a key role in the production of cells and neurotransmitters	Men: 550 mg/day Women: 425 mg/day Pregnant women: 450 mg/day Breastfeeding women: 550 mg/day	3,500 mg/day
Chromium	Meats, poultry, fish, some cereals	Helps control blood sugar levels	Adult men age 19-50: 35 ug/day Adult men age 51 and up: 30 ug/day Adult women age 19-50: 25 ug/day Adult women age 51 and up: 20 ug/day Pregnant women: 30 ug/day Breastfeeding women: 45 ug/day	Unknown
Copper	Seafood, nuts, seeds, wheat bran cereals, whole grains	Important in the metabolism of iron	Adults: 900 ug/day Pregnant women: 1,000 ug/day Breastfeeding women: 1,300 ug/day	10,000 ug/day
Fiber	Bran cereal, peas, lentils, black beans, fruits,	Helps with digestion and the maintenance of blood sugar levels; reduces the risk	Adult men age 19-50: 38 gms/day Adult men age 51 and up: 30 gms/day Adult women age 19-	None

	vegetables	of heart disease	50: 25 gms/day Adult women age 51 and up: 21 gms/day Pregnant women: 28 gms/day Breastfeeding women: 29 gms/day	
Fluoride	Fluoridated water, some sea fish, some tooth pastes and mouth rinses	Prevents the formation of tooth cavities and stimulates the growth of bone	Adult men: 4 mg/day Adult women (including pregnant and breast feeding): 3 mg/day	10 mg/day
Folic Acid (Folate)	Dark, leafy vegetables; enriched and whole grain breads; fortified cereals	Key for the development of cells, protein metabolism and heart health; in pregnant women, helps prevent birth defects	Adults: 400 ug/day Pregnant women: 600 ug/day Breastfeeding women: 500 ug/day	1,000 ug/day
Iodine	Processed foods and iodized salt	Important in the production of thyroid hormones	Adults: 150 ug/day Pregnant women: 220 ug/day Breastfeeding women: 290 ug/day	1,100 ug/day
Iron	Fortified cereals, beans, lentils, beef, eggs	Key component of red blood cells and many enzymes	Men: 8 mg/day Women age 19-50: 18 mg/day Women age 51 and up: 8 mg/day Pregnant women: 27 mg/day Breastfeeding women: 9 mg/day	45 mg/day
Magnesium	Green leafy vegetables, Brazil nuts, almonds, soybeans, halibut, quinoa	Helps with heart rhythm, muscle and nerve function, bone strength	Adult men age 19-30: 400 mg/day Adult men age 31 and up: 420 mg/day Adult women age 19-30: 310 mg/day Adult women age 31 and up: 320 mg/day Pregnant women: 350-360 mg/day Breastfeeding women: 310-320 mg/day	For magnesium in food and water, there is no upper limit. For magnesium in supplements or fortified foods: 350 mg/day

Manganese	Nuts, beans and other legumes, tea, whole grains	Important in forming bones and some enzymes	Men: 2.3 mg/day Adult women: 1.8 mg/day Pregnant women: 2.0 mg/day Breastfeeding women: 2.6 mg/day	11 mg/day
Molybdenum	Legumes, grains, nuts	Key in the production of some enzymes	Adults: 45 ug/day Pregnant and breastfeeding women: 50 ug/day	2,000 ug/day
Phosphorus	Milk and other dairy products, peas, meat, eggs, some cereals and breads	Allows cells to function normally; helps the body produce energy; key in bone growth	Adults: 700 mg/day Adults up to age 70: 4,000 mg/day Adults over age 70: 3,000 mg/day Pregnant women: 3500 mg/day Breastfeeding women: 4,000 mg/day	Unknown
Potassium	Sweet potato, bananas, yogurt, yellow fin tuna, soybeans	Important in maintaining normal fluid balance; helps control blood pressure; reduces risk of kidney stones	Adults: 4,700 mg/day Breastfeeding women: 5,100 mg/day	Unknown
Selenium	Organ meats, seafood, some plants (if grown in soil with selenium) Brazil nuts.	Protects cells from damage; regulates thyroid hormone	Adults: 55 ug/day Pregnant women: 60 ug/day Breastfeeding women: 70 ug/day	400 mg/day
Sodium	Foods to which sodium chloride (salt) has been added, like salted meats, nuts, butter and vast number of processed foods	Important for fluid balance	Adults age 19-50: 1500 mg/day Adults age 51-70: 1,300 mg/day Adults age 71 and up: 1,200 mg/day	2,300 mg/day
Zinc	Red meats, some seafood, fortified cereals	Supports the body's immunity and nerve function; important in reproduction	Men: 11 mg/day Women: 8 mg/day Pregnant women: 11 mg/day Breastfeeding women: 12 mg/day	40 mg/day

Unit – 4

Meal Planning of Various Age Group:

There is no one specific diet which fits for all the people, even if they belong to the same age group. Nutritional needs and requirements of different people vary largely even if a person is from a same age group. All diet plans are personalized and they depend the age, sex, likes and dislikes, tolerance, medical history, activity pattern and lifestyle of a person. Also certain nutritional deficiencies and medical conditions may require administration of a special diet with some restrictions or special considerations.

Meal plans for different sexes and age groups are,

Diet for Kids and Weaning Diet for Toddlers:

Starting from a toddler, a child after age one should be slowly weaned to solid foods that the other members of a family consume, obviously in different forms and amounts.

This transition should be gradually done between 12-24 months. A child when exposed to a variety of foods from each food groups will consume enough amounts of energy and other nutrients. Preschool age that is between 3-5 years is the time to inculcate good eating habits in your child. In this phase the growth is slow so the appetite may also be low, but good eating habits and lifestyle taught in this period can stay in the future. As your child grows older good nutritional and energy needs continue. However in this age the chances of getting finicky and notorious eating habits are high. To avoid such eating pattern, a child should be encouraged to sit with the family members to take all their major meals; this will help in the behavioral development and also in the re-enforcement of family values.

Toddler:

Children of the age of around one to around five years old are called as Toddler. After weaning, here's a plan for your child who's experimenting with different foods, ensuring he/she has optimal nutrition

Children from about one year old will have been weaned onto solid foods and can effectively eat the same foods as an adult, though obviously in different amounts. This stage in life is vital to good development both physically and mentally, therefore optimum nutrition is vital, not only for the child's health, but also reduction in risk of disease later in life. These few years are also times where the child experiments with a whole range of different foods and meals, and can shape eating patterns for their whole life. Try to steer your child away from processed foods and confectionary, and choose more traditional 'healthy' alternatives, though don't let them feel too left out from the other kids in the playgroup, and occasional treats are fine.

The following meal plan has been designed for a 'typical' toddler from the age of around one to around five years old. It's been compiled to be nutritionally balanced to suit a child who's active

and accounts for different likes and dislikes. Try to get your child to try different food choices, but remember if they really do not like a particular food, they need not have it; just praise them for trying it. Obviously all kids are different, so like all plans, it is merely an example and needs to be adapted to suit different circumstances.

Use this to give you an idea of what healthy nutritious foods are good to include, but don't forget get your child to drink plenty of fluid through the day. Try also to make foods fun and easy to eat; kids do often enjoy fruit, but won't eat it unless it's chopped up in a bowl for them to nibble on.

Breakfast	High fibre cereal (like Weetabix, Shreddies or porridge – (but avoid sugar coated cereal) + full cream milk (preferably no additional sugar although a very light sprinkling would be acceptable) 200ml fresh fruit juice
Mid-morning	1-2 whole wheat biscuits (e.g. oatcakes, digestive) Item fruit chopped up in a bowl 200ml full cream milk
Lunch	Sandwich: 2 slices wholemeal + butter + thin slice chicken/ham <i>or</i> tuna in low fat natural yoghurt. Chopped carrot and cucumber in a bowl Yoghurt. Drink water or diluted high-juice cordial
Mid-afternoon	1-2 whole wheat biscuits (e.g. oatcakes, digestive). Item fruit chopped up in a bowl 200ml full cream milk
Evening Meal	Typical family meal e.g.: 40-50g chicken breast / lean meat / white fish / 2 tbsp cooked basmati rice or 40g cooked pasta <i>or</i> small potato mashed/boiled/jacket Tbsp cooked veg. Drink water or diluted high-juice cordial
Evening	Drink water or diluted high-juice cordial or milk

The plan is based around encouraging the child to eat similar foods to the rest of the family. Try to get him/her to eat the same evening meal as you, even if it's at a different time, although sitting down together as a family is also important to behaviour development. Encourage your toddler to eat at similar times of the day, to steer them away from snacking and binging, however encourage them to drink whenever they're thirsty.

Children:

As your child gets older he/she will develop his/her own food habits; this plan is aimed at children from around 5 to 11-12 years old.

Following on from a toddler's diet, children from around age three or four through until adolescence are still developing both physically and mentally and the need for good nutrition continues. However this age is notorious for finicky diet habits, irregular eating and grazing; all behaviours which parents need to try to tempt their children out of. Kids are very active during these years and as they grow, nutritional requirements will increase and optimum nutrition is vital, not only for the child's health, but also for reduction in risk of disease later in life. During these years eating habits for life are still being shaped. Try to steer your child away from processed

foods and confectionary, and choose more traditional 'healthy' alternatives, though don't let them feel too left out from the other kids at school, and occasional treats are fine.

The following example meal plan has been designed for 'typical' children from the age of around five years old to around eleven or twelve, though obviously nutritional requirements and portion sizes of meals will vary considerably between younger and older children in this age bracket. The plan below has been compiled to be nutritionally balanced to suit children who are active and accounts for different likes and dislikes. Preparing different foods for your child is very important, but remember if they really do not like a particular food, they need not have it. Obviously all kids are different, so like all the plans here, it is merely an example and needs to be adapted to suit different ages, sexes, activities and general circumstances. If your child is really into sports or other physical activities then they will need lots of energy-packed foods throughout the day.

Use this plan to give you an idea of which healthy nutritious foods are good to include in your kid's diet, but don't forget to encourage him / her to drink plenty of fluids through the day. Remember that calcium foods, sources of essential fats; high protein foods and slow released carb sources need particular attention.

Breakfast	High fibre cereal (like Weetabix, Shreddies or porridge – avoid sugar coated cereal) + skimmed milk (preferably no additional sugar although a very light sprinkling would be acceptable) 1-2 slices granary bread (toasted) + olive oil based spread + jam / peanut butter 200ml fresh fruit juice
Mid-morning	1-2 whole wheat biscuits (e.g. oatcakes, digestive) Item fruit Drink
Lunch	Sandwich: 2 slices whole meal + butter + chicken/ham <i>or</i> tuna in low fat natural yoghurt or cheese. Chopped carrot / cucumber / celery in a bowl Yoghurt 1 square home-made easy flapjack Drink water <i>or</i> diluted high-juice cordial
Mid-afternoon	Item fruit Drink
Home from school	High fibre cereal (like Weetabix, Shreddies or porridge – avoid sugar coated cereal) + skimmed milk or 2 slices granary bread (toasted) + olive oil based spread + jam / peanut butter Drink
Evening Meal	Typical family meal e.g.: 100-120g chicken breast / lean meat / white fish 3-4 tbsp cooked basmati rice or 60g cooked pasta <i>or</i> small potato mashed/boiled/jacket. Cooked veg Drink
Evening	1 square home-made easy flapjack Item fruit Drink

The 'Home from school' snack will depend on what time your child finishes school and whether or not he / she partakes in any after-school activities. Children should be encouraged to eat the same evening meal as the whole family, and sitting down together is also important to help behavioural development and for the re-enforcement of family values. Encourage your child to eat at similar times of the day, to steer them away from snacking and bingeing, however encourage them to drink whenever they're thirsty.

Foods for Adolescents and Elders:

In adolescent years special considerations should be made that is the protein requirements are high, calcium requirement increases especially for girls, sources of essential fats and slow released carbohydrates should also be focused. The requirement for an adult male and female will again vary according to their job profile and needs and in general men will have higher requirements than women.

Adolescent:

This plan is aimed at parents responsible for adolescent kids, or the teenagers themselves looking to have a healthy, nutritious and convenient food intake

As your child grows up, they'll move on from following a child's diet, as they are now at an age when more and more food choice is down to them. This plan is therefore aimed both at parents of teenagers who have a responsibility to ensure their adolescent eats a good food, and at teenagers themselves – you may well be searching on the internet for good, healthy meal plans including food choices you like.

Adolescence is characterized from the age of 12 /13 to about 17/18, and in the latter years, the individual can really follow a suitable adult diet according to their needs (see other plans on this site).

However the problem with adolescence is that although children are becoming less finicky, there is increasing emphasis to fend for yourself. Now you're older your parents may work late or leave you home alone for a few days; or you may be out more with friends so need to grab something to eat. The one thing I do urge teenagers to avoid, is junk take-away foods too often; these must really only be very occasional treats.

The following example meal plan has been designed for 'typical' adolescents. Portion sizes may need to be varied between sexes, as boys generally require more than girls, and if you're into sports or heavy physical activities, then you'll need to eat more. The plan below has been compiled to be nutritionally balanced to suit teenagers who are active and accounts for different likes and dislikes.

Use this plan to give you an idea of which healthy nutritious foods are good to include in your diet, but remember to drink plenty of fluids through the day. A good calcium intake is especially

important in teenage girls through to the age of about 30 years. Also remember to include sources of essential fats; high protein foods and slow released carb sources.

Breakfast	High fibre cereal (like 2-3 Weetabix, Shreddies or porridge – avoid sugar coated cereal) + skimmed milk (preferably no additional sugar although a very light sprinkling would be acceptable) 2-3 slices granary bread (toasted) + olive oil based spread + jam / peanut butter 200ml fresh fruit juice
Mid-morning	1-2 whole wheat biscuits (e.g. oatcakes, digestive) or flapjack commercial / home-made easy flapjack Item fruit Drink
Lunch	Sandwich: 2-4 slices whole meal / granary bread + olive oil based spread + chicken/ham or tuna in low fat natural yoghurt or cheese Chopped carrot / cucumber / celery in a bowl Yoghurt 1 square home-made easy easy flapjack Drink water
Mid-afternoon	1-2 whole wheat biscuits (e.g. oatcakes, digestive) or flapjack commercial / home-made easy flapjack Item fruit Drink
Evening Meal	Typical family meal e.g.: 120-150g chicken breast / lean meat / white fish 5-6 tbsp cooked basmati rice or 600g cooked pasta or potatoes mashed / boiled / jacket Cooked veg Drink
Evening snack	High fibre cereal (like Weetabix, Shreddies or porridge – avoid sugar coated cereal) + skimmed milk <i>or</i> 2 slices granary bread (toasted) + olive oil based spread + jam / peanut butter Drink
Bedtime	Drink

Remember this plan is merely a guide to give you and your teenager an idea of good food choices. Try to eat at similar times of the day, and avoid snacking and binging, but do drink water whenever you're thirsty.

Male Adult:

A hypothetical diet plan for a 'typical' male

The following example meal plan has been designed for an 'average' male. It's nutritionally balanced to suit a young adult male who has a sedentary job and weighs 70-75kg, and he should maintain his weight on this. Obviously this is a hypothetical male, so like all plans, it is merely an example and needs to be adapted to suit an individual's own lifestyle, daily routine and nutritional requirements. Use this to give you an idea of what are healthy nutritious foods to include, but don't forget to vary your food choices and to drink plenty of water through the day.

Breakfast	High fibre cereal (like Weetabix, bran flakes, Shreddies, muesli, porridge, etc) + 200ml skimmed milk + 1 tsp sugar 200ml fruit juice Mug tea/coffee
Mid-morning	2 oatcakes Item fruit Drink
Lunch	Sandwich: 2 slices granary bread + olive oil-based spread + slice chicken/ham or tuna in low fat natural yoghurt or smoked salmon Mixed salad Low fat / low sugar yoghurt Drink
Mid-afternoon	2 oatcakes Item fruit Drink
Evening Meal	180g chicken breast <i>or</i> 200g white fish <i>or</i> 180g lean meat and 3-4 tblsp basmati rice or 2 cupfuls cooked pasta or 1 medium potato and loads of veg or large salad
Evening	Drink 2-3 oatcakes + low fat soft cheese

Female Adult:

A hypothetical diet plan for a 'typical' female

The following example meal plan has been designed for an 'average' female. It's nutritionally balanced to suit a young adult female who has a sedentary job and weighs 60-65kg, and she should maintain her weight on this. Obviously this is a hypothetical female, so like all plans, it is merely an example and needs to be adapted to suit an individual's own lifestyle, daily routine and nutritional requirements. Use this to give you an idea of what are healthy nutritious foods to include, but don't forget to vary your food choices and to drink plenty of water through the day.

Breakfast	High fibre cereal (like Weetabix, bran flakes, Shreddies, muesli, porridge, etc) + 200 ml skimmed milk + 1 tsp sugar 200 ml fruit juice Mug tea/coffee
Mid-morning	Item fruit Drink
Lunch	Sandwich: 2 slices granary bread + olive oil-based spread + slice chicken/ham or tuna in low fat natural yoghurt or smoked salmon Mixed salad or salad with tuna/salmon /chicken/ham + crisp bread Low fat / low sugar yoghurt Drink
Mid-afternoon	Small flapjack <i>or</i> cereal bar Item fruit Drink
Evening Meal	120g chicken breast or 140g white fish or 120g lean meat <i>and</i> 2-3 tblsp basmati rice or 2 cupfuls cooked pasta or 1 medium potato and loads of veg or large salad

Evening	Drink Item fruit
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Diet for Pregnant Women:

But during pregnancy nutritional needs of a woman shall increase to support the growth and development of the growing fetus. Certain important nutrients like folic acid, vitamin A, iron and calcium needs will be high to ensure proper growth and prevent any birth defects. Many foods like alcohol, tea, coffee and fish with high mercury levels should be avoided as far as possible in this group. A meal plan for an elderly male and female would focus mainly to suit the sedentary lifestyle and to maintain a reasonable health. Further any health issues shall be considered first before planning any diet for any age group.

Pregnancy :

Healthy eating guidelines for pregnancy and a suitable meal plan for expectant mothers

During pregnancy it's important to ensure optimal health for the mother as well as ideal nutrition for the baby to ensure that he/she develops properly. It's important to eat sensibly and the basic healthy eating guidelines apply with a few additional considerations:

a) Folic Acid (Folate)

Folic acid is a B vitamin and it has been shown that mothers need higher than normal amounts in order to reduce the risk of neural tube defects (e.g. spina bifida) in the infant. Women who are pregnant or who are planning a pregnancy should supplement with 0.4mg (400mcg) of folic acid every day, and continue to do so for the first 12 weeks of pregnancy. Women who have previously had a baby with a neural tube defect or who are on drug therapy for epilepsy are often prescribed higher doses of 5mg per day (consult your doctor). In addition, expectant mothers are encouraged to ensure their diet includes foods which are rich in folate, including citrus fruits and juices, dark green leafy vegetables, legumes and whole grains as well as including good amounts of foods which are fortified with additional folic acid, e.g. fortified breads, breakfast cereals and yeast extract.

b) Vitamin A

High levels of some forms of vitamin A can harm the baby's development if taken in too high amounts during pregnancy. Mothers therefore should avoid vitamin A supplements and food rich in animal forms of vitamin A, for example liver, throughout their pregnancy.

c) Iron

It's important for the mother to consume good amounts of iron rich foods during pregnancy. Iron from both animal food sources and plant sources are encouraged.

d) Calcium

This is important for healthy bones. Eat plenty of calcium rich foods and aim for 1,000mg per day.

e) Nuts

Expectant mothers should avoid nuts, peanuts and nut products in order to reduce the risk of your child developing a nut or peanut allergy. This is especially important if the mother suffers from asthma, eczema or hay fever.

f) Oily Fish

Whilst a good intake of essential fats is important during pregnancy, too much oily fish that may contain high levels of mercury is not advised. It is therefore suggested that an expectant mother limits herself to two portions of oily fish per week.

g) Alcohol

Although there may be no harm in consuming a little alcohol occasionally during pregnancy, the current recommendation is for an expectant mother to avoid alcohol altogether.

h) Tea / Coffee

High caffeine consumption has been linked to an increased risk of miscarriage, so it's probably wise to limit caffeine. Cut down to a maximum of one or two cups of tea or coffee per day. More recent studies have linked green tea to the lowering of folic acid levels, so try to avoid green tea whilst trying to conceive and during the first 12 weeks of pregnancy; after 3 months, 1-2 cups of green tea per day will be fine.

Healthy Weight

It's important that the mother doesn't gain excessive amounts of body fat and the ideal weight gain is 9-13kg (1½ - 2 stones) during pregnancy. Excess weight gain is difficult to lose afterwards. If you are overweight prior to becoming pregnant, then eat healthily during the pregnancy to minimize any further weight gain.

Food Safety

It's especially important during pregnancy to ensure that food is prepared properly and free from contamination in order to minimize risk of food poisoning. As pregnancy impairs a mother's immune system, food poison bacteria like salmonella and listeria are even more of an issue. Avoid the following: raw eggs or foods which contain raw eggs, unpasteurized milk, soft, unpasteurized cheeses such as feta, goat, Brie, Camembert, and blue cheese and raw or undercooked meats or fish.

Although the risk of listeria from deli meats is very low, as a matter of caution it's also best to avoid deli meats during pregnancy.

Morning Sickness

This usually occurs only during the first four months. If it is a problem, stick to light energy-dense foods, but never skip meals. A fizzy drink and a plain biscuit may be better tolerated. Avoid fried and spicy foods.

Heartburn

This is not uncommon later in pregnancy. Again, avoid fried and spicy foods, and don't drink at meal times.

Constipation

Eat plenty of high fibre foods and drink plenty of fluid (12 cups per day). However, avoid natural unprocessed bran and unprescribed laxatives.

Breast Feeding

Generally this is encouraged over bottle feeding, as it helps provide the new-born infant with optimal nutrition, as well as helping the mother to lose some of the excess fat gained during pregnancy from around the bum and hips. However if you do choose to breast feed drink plenty of fluid and continue to heed all the points above.

The following meal plan is an example plan of a healthy diet which is suitable for a pregnant mother. It is aimed at providing sufficient nutrition for both mother and infant with a healthy weight gain for the mother. Use this to give you an idea of what are healthy and nutritious foods to include, but don't forget to vary your food choices and to drink plenty of water through the day. Food portion sizes will need to be adjusted to suit different women with different activities.

Breakfast	High fibre cereal (porridge, no added sugar muesli, Shredded Wheat, Weetabix, etc) + 200ml skimmed milk and/or 1-2 slices granary bread with olive oil-based spread and natural jam, marmalade, honey 250ml fruit juice
Mid-morning	1-2 oatcakes or rye crisp bread Banana Tbsp sunflower seeds Drink water
Lunch	Sandwich: 2 slices granary bread + olive oil-based spread + cooked chicken breast, sliced ham, tuna or cheese or 3-4 oatcakes or rye crisp bread with cottage cheese Mixed salad Low fat / low sugar yoghurt Drink water
Mid-afternoon	1-2 oatcakes or rye crisp bread Banana Tbsp sunflower seeds Drink water
Evening Meal	Chicken breast or white fish or lean meat and (dry weight) basmati rice or whole wheat pasta or 5-6 small boiled new potatoes or sweet potato and loads of veg or large salad Gravy / sauce – optional Drink water
Evening	High fibre cereal (porridge, no added sugar muesli, Shredded Wheat, Weetabix, etc) + 200ml skimmed milk Drink water

As with all the meal plans this is merely a guide and a mother is encouraged to eat a variety of different meats / fish / alternatives, complex carbohydrates, fruit and vegetables every day, and drink plenty of water. Adapt the plan to suit your own needs and daily routine and vary portions and food choices from day to day.

Elderly Person:

A meal plan for an elderly person who is moderately active and in reasonable health

The following example meal plan has been designed for a typical elderly individual. It's nutritionally balanced to suit an elderly person who is moderately active and in reasonable health in order to maintain their weight. Obviously this is based on an average elderly person, and there may be significant variation in activity, mobility, weight, appetite, etc, so like all plans, it is merely an example and needs to be adapted to suit an individual's own lifestyle, daily routine and nutritional requirements. Use this to give you an idea of what are healthy nutritious foods to include, but don't forget to vary your food choices.

One particular concern in the elderly is obtaining sufficient fluid intake. Following retirement it's not uncommon for people to drink less, as they no longer have scheduled coffee breaks at work. The plan below includes drinks, but it's also recommended to drink more water throughout the day. Some old people also have difficulty in passing stools; therefore a good fibre intake is encouraged.

It's even more important that elderly people try to stick to meal and snack times, as sometimes motivation to prepare food can be low, especially if you're only preparing meals for one. With increased age and the onset of disease, some assistance may be required with preparation and feeding.

Breakfast	High fibre cereal (like Weetabix, bran flakes, Shreddies, muesli, porridge, etc) + 200ml skimmed milk + 1 tsp sugar 200ml fruit juice Mug tea/coffee
Mid-morning	2 digestive biscuits Item fruit Drink
Lunch	Sandwich: 2 slices wholemeal bread + olive oil-based spread + slice chicken/ham or 2 eggs (poached / scrambled / boiled) + 2 slices wholemeal toast Mixed salad Low fat / low sugar yoghurt Drink
Mid-afternoon	Item fruit Drink
Evening Meal	Medium chicken breast or 200g white fish (cod / haddock / plaice / hake) or lean cut beef / pork / lamb <i>and</i> 1 medium jacket potato or 3-4 small

	boiled potatoes / mashed potato and loads of veg Gravy – optional Tinned or stewed fruit Drink water
Evening	Hot milky drink

Vegetarian meal planning for Age group 6 to 12 months:

When you introduce solid foods to your baby for the first time, start with small portions once a day. You can then move to twice a day and start increasing the portion size.

But do not try to force feed your baby. Instead, choose a time when your baby is hungry but not yet sleepy. If he's sleepy, he might not be in an adventurous enough mood to try out new foods and textures.

It is also important to try out one food at a time. When you introduce one food, give it to your baby for at least five days before introducing another new food. This will make it easier for you to pinpoint how your baby reacts to each food and spot allergies in case they appear.

Remember not to add any salt to your baby's food.

Vegetarian meal plan: six to seven months:

- **Breakfast** - breast or formula milk
- **mid morning** - breast or formula milk or stewed apple
- **lunch** - mashed rice mixed with breast or formula milk
- **mid afternoon** - breast or formula milk
- **dinner** - breast or formula milk
- **bedtime** - breast or formula milk

Vegetarian meal plan: eight to nine months:

- **Breakfast** - breast or formula milk
- **mid morning** - mashed banana
- **lunch** - mashed khichdi with carrots (gajar) and pumpkin (kaddu or sitaphal)
- **mid afternoon** - breast or formula milk
- **dinner** - mashed vegetable soup with potatoes
- **bedtime** - breast or formula milk

Vegetarian meal plan: 10 to 11 months:

- **Breakfast** - breast or formula milk
- **mid morning** - stewed pear
- **lunch** - mashed khichdi with vegetables and fruit or mashed idli with curd and vegetables
- **mid afternoon** - breast or formula milk
- **dinner** - mashed vegetable soup with potatoes or mashed khichdi with vegetables and fruit
- **bedtime** - breast or formula milk

Vegetarian meal plan: 12 months and beyond:

By now your baby will mostly be on solid foods. Here are several ideas for each meal time for you to choose from:

- **Breakfast** - infant oats or porridge (dalia); idli with dal; rice dosa with mashed vegetables; moong dal cheela; moong dal dosa; sooji/rawa upma (with or without vegetables)

- **mid morning** - stewed fruit (apple or pear) or mashed banana
- **lunch** - mixed vegetables with rice; vegetable khichdi; roti soaked in dal and then mashed; mashed kidney beans (rajma) or chickpeas (kabuli channa or chholey) with rice; paneer
- **mid pm** - breast or formula milk
- **dinner** - vegetable stew; roti soaked in vegetable stock or dal; pasta with tomato sauce; palak paneer; whole wheat bread with milk; French toast; stuffed parantha
- **bedtime** - breast or formula milk

Vegetarian desserts from 8 months onwards:

- Fruit smoothies
- Stewed fruits with custard
- Rice, sooji or rawa, ragi (nachni) or lauki kheer
- fruit yoghurts
- Sooji or gajar ka halwa
- rawa kesari

It is best not to add any sugar as most fruits are naturally sweet to taste. However if you must add sugar, use very little. Your baby's taste buds are still developing and it would be wise to restrict sweet foods.

Meal Plan Patterns for Children According to Group:

Below are 4 different calorie levels for adults based on the basic food groups. It is best to decide on a calorie level according to age, gender and weight. Talk with a doctor before changing your meal plan patterns.

Food Group	Daily Calorie Level			
	1,200	1,600	1,800	2,200
Fruit	1 cup	1.5 cups	1.5 cups	2 cups
Vegetables	1.5 cups	2 cups	2.5 cups	3 cups
Grains	4 oz	5 oz	6 oz	7 oz
Leans meat and beans	3 oz	5 oz	5 oz	6 oz
Milk	2 cups	3 cups	3 cups	3 cups
Oils	4.5 tsp	5.5 tsp	6 tsp	7.5 tsp
Free-to-use Calories	170	130	195	290

* Free-to-use Calories can be used in various ways. If you are trying to lose weight, you may choose NOT to use these calories. If you want to maintain your weight, then you CAN use these calories.

Meal Plan Patterns for Adults According to Group:

Food Group	Daily Calorie Level			
	1,600	2,000	2,400	2,800
Fruit	1.5 cups	2 cups	2 cups	2.5 cups
Vegetables	2 cups	2.5 cups	3 cups	3.5 cups
Grains	5 oz	6 oz	8 oz	10 oz
Leans meat and beans	5 oz	5.5 oz	6.5 oz	7 oz
Milk	3 cups	3 cups	3 cups	3 cups
Oils	5.5 tsp	7 tsp	8 tsp	7 tsp
Free-to-use Calories	130	270	360	425

* Free-to-use Calories can be used in various ways. If you are trying to lose weight, you may choose NOT to use these calories. If you want to maintain your weight, then you CAN use these calories.

Methods of Cooking:

In cooking, there are some basic methods of cooking that are used. These commonly used basic cooking methods are divided into two general groups. The groups are: Dry heat cookery methods and Moist heat cookery methods. The methods of cooking are divided into these two groups because of the way food is cooked and the type of heat that is used. Let us have a look at the Dry Heat cookery methods.

A) Dry Heat Cooking Methods:

In dry heat cooking methods, the food being cooked does not use water to cook the food. The food is left dry and heat is applied to cook the food. Such methods of cooking are: baking, steaming, grilling, and roasting. When heat is applied to the food, the food cooks in its own juice or the water added to the food during its preparation evaporates during the heating process and this cooks the food. Heat is applied directly to the food by way of convection thus making the food to get cooked. The action or movement of air around the food, cooks it. Let us now have a look at each of these cooking methods

a) Baking

In baking method of cooking, the food is cooked using convection heating. The food is put into an enclosed area where heat is then applied and the movement of heat within the confined space, acts on the food that make it get cooked.

b) Steaming

To steam food, water is added to a pot and then a stand is placed inside the pot. The water level should be under the stand and not above it. There is no contact between the food and the water that is added to the pot. Food is then placed on the stand and heat is applied. The hot steam rising from the boiling water acts on the food and the food gets cooked. It is the hot steam that cooks the food, as there is no contact between the food and the water inside the pot. This method of cooking for vegetables is very good as the food does not lose its flavour and much of the nutrients are not lost during the cooking.

c) Grilling

There are two methods of grilling that are used these days. One type of grilling is the one that is commonly used by the people in the village. This is when food is cooked over hot charcoal on an open fire. The food is placed on top of the burning charcoal. Sometimes people improvise by using wire mesh and place it over the open fire to grill fish or vegetables. The other method is using grills that are inbuilt in stoves. In this method, the griller, which has a tray, is heated up and

the food is placed on the grill tray to cook. The heat can be gas-generated or electric-generated depending on the type of stove used. The food is again left to cook on the grill with the doors of the grill open. People who can afford to buy a stove would use the grilling part to grill their food. What happens in this type of cooking is the heat seals the outside part of the food and the juice inside the food cooks it. The flavour of the food is not lost and much of the nutrients are not lost either. Food is frequently turned over to prevent it from burning and to ensure that equal heating and cooking time is applied to both sides of the food. By doing this, the food is cooked evenly and thoroughly.

d) Roasting

With roasting, direct heat is applied to the food. The heat seals the outside part of the food and the juice inside the food cooks the food. Roasting is mainly used when cooking fleshy food like fish, meat or chicken. When heat is applied to the outer covering of the food, it seals it up thereby trapping all the juices inside the food. The action of direct heating, heats up the juices inside the food, which then cooks the food. Again there is very little nutrient lost and the flavour is not spoilt. Food is frequently rotated over the spit so that there is even heating applied to all parts of the food. This is so that heat is applied evenly to the food to make it get cooked properly.

B) Moist Heat Cooking Methods :

In moist heat cookery methods, liquid is used as a medium to cook the food. Such medium could be water, coconut cream or oil. These liquids are added to the food before heat is applied to it or sometimes heat is applied to the liquid before the food is added into the cooking utensils to be cooked. The moist heat cookery methods include: boiling, stewing, shallow frying, deep frying, barbequing and basting. All these moist heat cooking methods use liquid to cook the food in.

a) Boiling

This is the most common method of cooking and is also the simplest. With this method of cooking, enough water is added to food and it is then cooked over the fire. The action of the heated water makes the food to get cooked. The liquid is usually thrown away after the food is cooked. In the case of cooking rice, all the water is absorbed by the rice grains to make it get cooked. During the heating process, the nutrients can get lost or destroyed and the flavour can be reduced with this method of cooking. If you over cooked cabbage, all the nutrients can get lost.

b) Stewing

In the process of cooking using the stewing method, food is cooked using a lot of liquid. Different kinds of vegetables are chopped, diced or cubed and added to the pot. Sometimes pieces of selected meat, fish or chicken is also chopped and added to the stew. The liquid is slightly thickened and stewed food is served in that manner. This method is also used when preparing fruits that are going to be served as desserts. With this cooking method, every food is cooked

together at the same time in one pot. The flavour, colours, shapes and textures of the different vegetables that are used, makes stewing a handy method of cooking. The only disadvantage is that some of the vegetables might be overcooked and thus the nutrient content becomes much less. It is therefore important that the vegetables that take the longest to cook to be put into the pot first and the ones that need least cooking to be put in last. In this way much of the nutrient contents of the food does not get lost.

c) Frying

When food is fried using oil or solid fat it is important that you observe some rules in handling oil or fat. *Simple rules to follow when frying:* 1. Make sure there is enough oil or fat put in the frying pan or a deep frying pan. 2. The food to be cooked must not have water dripping from it. This is because when water comes into contact with hot oil or fat, you will have the oil sizzling and spitting out of the pan, which could burn your skin if you are not careful. 3. Put the food into the hot oil carefully. Try not to make a big splash as the oil could burn your skin. 4. The oil or fat should be heated to the right temperature before putting food into the pan to be fried. If the food is put in when the oil or fat is not heated to the right temperature, the food will soak up the oil and you will have food that is all oily or greasy. If the oil or fat is over heated, you will end up with food that is burnt. Sometimes the food especially doughnuts will turn brown on the outside but the dough inside is uncooked. To cook food using the frying method, there are two ways of doing it. There is the shallow frying and the deep frying methods.

d) Shallow Frying

In shallow frying, food is cooked in a frying pan with a little amount of oil or fat. The oil or fat is heated to the correct amount and the food is put into the heated oil. The food is turned over a few minutes or is stirred around a couple of times before it is cooked and dished out. If patties, potato chips or coated foods are fried, it is best to put a piece of brown paper or paper napkin inside the tray to soak up any oil from the food before serving it.

e) Deep Frying

This is when a lot of oil or fat is used in cooking the food. The oil or fat is usually put into a deep pan and is heated to boiling point. Food is then put into the hot boiling oil and is cooked in that way. Such food as fish fingers, potato chips, meat balls, and dough nuts to name a few, are cooked using the deep frying method.

f) Barbequing

The method of cooking food by barbequing is usually associated with fund raising activities, parties or picnics. It is most suitable to cooking meat cutlets, fish or chicken pieces. The food is usually marinated with spices and tenderizers (for meat cuts) for sometime before it is cooked. With this method of cooking, a sheet of metal with stands is heated up and oil is used to cook the

food. A sufficient amount of oil is heated up and food is added. The food is then turned over a couple of times before it is dished out.

g) Basting

This method of cooking is usually associated with roasting. The juice or liquid that comes out of the meat being cooked is spooned over the roast frequently while it is being roasted. The outer part of the meat is moistened frequently during the cooking process with the juice that is being spooned over. Usually, the extra juice from the cooked meat is added to a mixture to make the meat sauce.

Other methods :

Some foods that require a long time to cook, such as stews and dried beans may be prepared more quickly in a pressure sauce pan. This utensil cooks foods at high temperatures by means of steam under pressure. Pressure saucepans are also called pressure cookers.

Another fast method of cooking uses microwaves (short radio waves). Microwave ovens heat small amounts of foods much faster than gas or electric ovens or cook tops do. Microwave ovens are especially useful for thawing frozen foods and heating soups, vegetables, and leftovers.

Food Adulterations and its Effects:

Food adulteration is the addition or removal of any substances to or from food, so that the natural composition and quality is affected. Adulterated food is impure, unsafe and not wholesome. Food can be adulterated intentionally and accidentally. Unintentional adulteration is a result of ignorance or the lack of facilities to maintain food quality. This may be caused by spillover effect from pesticides and fertilizers. Inappropriate food handling and packaging methods can also result in adulteration. 25 to 30 per cent of the food items in India are intentionally adulterated.

Intentional food adulteration is usually done for financial gain. The most common form of intentional adulteration is colour adulteration. Some examples of intentional adulteration are addition of water to liquid milk, extraneous matter to ground spices, or the removal or substitution of milk solids from the natural product. Natural adulteration occurs due to the presence of certain chemicals, organic compounds or radicals naturally occurring in foods which are injurious to health and are not added to the foods intentionally or unintentionally. Some of the examples are toxic varieties of pulses, mushrooms, green and other vegetables, fish and sea foods. About 5,000 species of marine fish are known to be poisonous and many of these are among edible varieties.

Beyond safety limit

Mineral oil may be added to edible oil and fats and can cause cancers. Lead chromate added to turmeric powder and spices can cause anaemia, paralysis, brain damage and abortions. Lead added to water, natural and processed food can lead to lead poisoning. Lead poisoning causes foot drop, insomnia, constipation, anaemia, and mental retardation. Cobalt added to water and liquors

and can cause cardiac damage. Copper, tin and zinc can cause colic, vomiting and diarrhoea. Mercury in mercury fungicide treated grains or mercury contaminated fish can cause brain damage, paralysis and death. Non-permitted colour or permitted food colour like metanil yellow, beyond the safe limit in coloured food can cause allergies, hyperactivity, liver damage, infertility, anaemia, cancer and birth defects.

Adulteration in Food Stuff and its Harmful Effects:

Food Article	Adulterant	Harmful Effects
Bengal Gram dal and Thoor Dal	Kesari dal	Lahyrisms cancer
Tea	Used tea leaves processed and coloured	Liver Disorder
Coffee Powder	Tamarind seed, date seed powder	Diarrhoea
	Chicory powder	Stomach disorder, Giddiness and joint pain
Milk	Unhygienic water and Starch	Stomach disorder
Khoa	Starch and Less Fat content	Less - nutritive value
Wheat and other food grains (Bajra)	Ergot (a fungus containing poisonous substance)	Poisonous
Sugar	Chalk powder	Stomach - Disorder
Black powder	Papaya Seeds and light berries	Stomach, liver problems
Mustard powder	Argemone seeds	Epidemic dropsy and Glucoma
Edible oils	Argemone oil	Loss of eyesight, heart diseases, tumour
	Mineral oil	Damage to liver, carcinogenic effects
	Karanja oil	Heart problems, liver damage
	Castor oil	Stomach problem
Asafoetida	Foreign resins galbanum, colophony resin	dysentery
Turmeric powder	Yellow aniline dyes	Carcinogenic
	Non-permitted colourants like metanil yellow	Highly Carcinogenic
	Tapioca starch	Stomach disorder
Chilli powder	Brick powder, saw dust	Stomach problems
	Artificial Colours	Cancer
Sweets, Juices, Jam	Non-permitted coal tar dye, (Metanil Yellow)	Metanil yellow is toxic and carcinogenic
Jaggery	Washing soda, chalk powder	vomiting, diarrhea
Pulses (Green peas and dhal)	Coal tar dye	stomach pain, ulcer
Supari	Colour and saccharin	Cancer

Honey	Molasses sugar (sugar plus water)	Stomach disorder
Carbonator water beverages	Aluminium leaves	Stomach Disorder
Cloves	Cloves from which volatile oil has been extracted	cheating waste of money

Prevention

The best way to avoid these health problems is prevention. There are many steps we can take to ensure this. We can begin by taking interest in the place from where we buy our food ingredients, for example, is it from a reputed shop or retailer, we need to check out. We also need to check if these outlets are regularly checked by food inspectors and if the premises are kept clean with no infestations. We need to check if the packaging is intact, as also the expiry date and the source of the product. It is also necessary to talk regularly to the local community to check if people are falling sick after eating in a particular restaurant or food ingredients bought from a particular retailer. We should also create awareness in the local community on the ill effects of food adulteration so that when it happens the public knows when to seek help.

We need to remember that contamination could happen in very small amounts over a period of time and it might be impossible to detect or too late to intervene. So it is prudent that every one of us takes special interest in this subject and educate our families, friends and colleagues about this menace.

Alcoholism:

An alcoholic is a person, while alcoholism is the illness. An alcoholic suffers from alcoholism. Alcoholism is a long-term (chronic) disease.

Alcoholism is a chronic and often progressive disease that includes problems controlling your drinking, being preoccupied with alcohol, continuing to use alcohol even when it causes problems, having to drink more to get the same effect (physical dependence), or having withdrawal symptoms when you rapidly decrease or stop drinking. If you have alcoholism, you can't consistently predict how much you'll drink, how long you'll drink, or what consequences will occur from your drinking.

Alcoholism is a disease with four main features:

- a) Craving - a strong need to drink
- b) Loss of control - not being able to stop drinking once you've started
- c) Physical dependence - withdrawal symptoms, such as nausea, sweating, or shakiness when you don't drink
- d) Tolerance - the need to drink greater amounts of alcohol to feel the same effect

It's possible to have a problem with alcohol, even when it has not progressed to the point of alcoholism. Problem drinking means you drink too much at times, causing repeated problems in your life, although you're not completely dependent on alcohol.

Binge drinking: A pattern of drinking where a male consumes five or more drinks in a row, or a female downs at least four drinks in a row, can lead to the same health risks and social problems associated with alcoholism. The more you drink, the greater the risks. Binge drinking, which often occurs with teenagers and young adults, may lead to faster development of alcoholism.

Alcoholism carries many serious dangers. Heavy drinking can increase the risk of certain cancers. It can cause damage to the liver, brain, and other organs. Drinking during pregnancy can harm your baby. Alcoholism also increases the risk of death from car crashes, injuries, homicide, and suicide.

If you want to stop drinking, there is help. Start by talking to your health care provider. Medicines, counseling, and support groups may help you to stop drinking.

Therapeutic diet and its Types:

A therapeutic diet is a medically prescribed eating plan recommended as a mode of treatment for a chronic disease. It usually requires you to eliminate or limit certain types of foods, eat more of certain types of foods, change the consistency of your foods or alter your eating pattern.

A therapeutic diet is a diet that is formulated usually by nutritionists, dieticians, and medical doctors to aid in the healing of the body from certain types of injuries and diseases. Therapeutic treatments involving food are also prescribed for medical conditions that affect the psychological state of the individual as well, such as weakness caused by anorexia, or a loss of appetite due to depression, loneliness, and other mental states that can discourage healthy eating. More common conditions that may require a therapeutic diet include the loss of teeth with age, which may necessitate a diet of soft foods, or a calorie-, fat-, and sodium-controlled diet to treat such routine conditions as being overweight, having high cholesterol levels, or being borderline diabetes.

Types of Therapeutic diets:

1. Diabetic – consistent carbohydrates
2. Heart diets – low fat low salt
3. Renal – low potassium
4. Bowel health – high fiber
5. Food intolerance – gluten, dairy
6. Food allergy – peanut, soy, fish
7. Malnutrition – high energy/high protein
8. Wound management – high protein/energy
9. Sodium restricted diet

10. Bland diet
11. Low residue diet
12. Regular diet
13. Liquid diet
14. Soft diet
15. Calorie controlled diet

The diabetic diet helps in figuring the deficiency or diminished effectiveness of insulin to maintain blood glucose in the normal range. The therapeutic diet then helps in examining the unrefined carbohydrates eaten. An excess leads to limiting the intake of food products rich carbohydrates.

Heart problems are normally caused by fat can cause blockages in arteries, which can lead to excessive weight. The heart diet helps in reducing saturated fats and limits the intake of excessive sugar. This therapeutic diet is used to cure cardiovascular diseases such as hypertension or congestive heart disease, kidney disease, and edema. One has to avoid or limit addition of salt to any food, smoked meats or fish, processed foods, pickles, sauerkraut, olives, and processed cheeses.

The high fiber diet helps the body in curing constipation related problems by increasing fiber in the diet. It is advised to consume a lot of fluids in this diet.

A regular diet is a diet which is usually used for ambulatory patients. It has less caloric content in it and most fried foods and rich desserts are to be avoided in this diet.

A soft diet is similar to regular diet but foods must require little chewing and be easy to digest. It is said that one should avoid meat and shellfish with tough connective tissue, coarse cereals, spicy foods, rich desserts, fried foods, raw fruits and veggies, nuts, and coconuts.

The high protein diet is all about children and adolescents who need additional growth, pregnant or lactating women, before and/or after surgery, suffering from burns, fevers, or infections. One can follow a regular diet with added protein rich foods such as meats, fish, milk, cheese, and eggs. There are many drawbacks to the therapeutic diet plan. It can cause, A patient's appetite may be affected by this reduced or loss of appetite, weakness, illness, loneliness, self-pity and other factors.

One can use patience and tact to convince patient to eat food and understand purpose of therapeutic diet and provide simple explanations to patient. A therapeutic diet is not supposed to make one person ill.

Diet modification in Diseases:

Certain medical conditions require a modification in the texture of a diet because of swallowing or chewing difficulties. A liquid diet, for example, would be prescribed for a post-surgical patient

who needs easily digested nutrition or a person who has had oral surgery and is unable to consume larger chunks of food. A puréed or blended diet would be provided for an elderly nursing home patient who is unable to chew food to a safe consistency for swallowing. When a soft diet is prescribed, tough meats are either chopped or ground and served with a sauce or gravy for easier chewing and swallowing. Foods such as corn on the cob or nuts are eliminated from a soft diet.

Diet therapy also refers to nutrient modification for therapeutic purposes. A diet type described as “low” would minimize a certain nutrient or nutrients. A low-fiber diet, for example, might be prescribed for a patient after stomach or intestinal surgery to reduce the amount of digestion taking place after a meal. Other diet therapy types that minimize nutrients include a low-cholesterol diet, a low-sodium diet or a low-oxalate diet.

Certain conditions require an increase in nutrient intake. Pregnancy diets are prescribed to supply the mother and fetus with extra calories, protein, iron and folate. A high-fiber diet might be recommended for patients suffering from constipation, which is a side effect of many pain medications.

A comprehensive diet plan, prescribed for patients with multiple issues, might increase certain nutrients and minimize others. Patients who suffer from heart disease, diabetes or obesity might be prescribed a plan that reduces the amount of calories, fats and sugars in the diet but increases fiber and protein intake for satiety. For a person to ensure that a diet therapy regimen is sound and appropriate for a particular medical condition, it is important for him or her discuss nutritional intake, including the use of alternative therapies such as dietary supplements, with a licensed healthcare provider.

DASH Diet:

The Dietary Approaches to Stop Hypertension, also known as the DASH diet, is a therapeutic diet used to treat high blood pressure. The diet encourages you to eat foods that contain high amounts of potassium, magnesium, calcium and fiber to help lower your blood pressure. It also recommends you limit your intake of sodium to 1,500 mg a day if you have high blood pressure. The DASH diet is considered an overall healthy diet and has also been shown to be helpful for those wishing to lose weight and prevent the onset of diabetes. The diet includes high amounts of fruits, vegetables and whole grains, along with lean sources of protein, low-fat dairy foods, nuts, seeds and legumes.

Representative Diet in Various Diseases:

Diabetic Diet:

The diabetic diet is a therapeutic diet for treatment of diabetes. The principle behind the eating plan is that people with diabetes have a difficult time managing the sugar their body produces

from the food they eat due to an inability to make enough insulin or properly use the insulin they do make. The diabetic diet aims to control the amount of food you eat, especially foods that dramatically affect blood sugar, to help manage the disease. The diet is not overly restrictive, but encourages you to make wise food choices from each of the food groups to maximize your nutritional intake. The diet also aims to promote a healthy weight because this improves blood sugar management.

Diet for Diabetic mellitus:

If you have diabetes, your body cannot make or properly use insulin. This leads to high blood glucose, or blood sugar, levels. Healthy eating helps keep your blood sugar in your target range. It is a critical part of managing your diabetes, because controlling your blood sugar can prevent the complications of diabetes.

A registered dietitian can help make an eating plan just for you. It should take into account your weight, medicines, lifestyle, and other health problems you have.

Healthy diabetic eating includes

- Limiting foods that are high in sugar
- Eating smaller portions, spread out over the day
- Being careful about when and how many carbohydrates you eat
- Eating a variety of whole-grain foods, fruits and vegetables every day
- Eating less fat
- Limiting your use of alcohol
- Using less salt

Diets for Cardiovascular Diseases:

The role of diet is crucial in the development and prevention of cardiovascular disease. Diet is one of the key things you can change that will impact all other cardiovascular risk factors.

Comparisons between a diet low in saturated fats, with plenty of fresh fruit and vegetables, and the typical diet of someone living in the developed world show that in the former there is a 73% reduction in the risk of new major cardiac events.

Fat

Research makes it clear that abnormal blood lipid (fat) levels have a strong correlation with the risk of coronary artery disease, heart attack and coronary death. In turn, abnormal blood lipids are related to what you eat. A diet high in saturated fats (e.g. cheese) and trans fats (often used in cakes, cookies and fast food) leads to high levels of cholesterol.

Saturated fats are found in animal products. Trans fats are oils that have been hydrogenated to turn them into semi-hard fats. Hydrogenated fat is found in processed food like shop-bought

cakes, biscuits, stock cubes and a range of other products you buy every day. Saturated and trans fats raise cholesterol levels in the blood, which in turn can lead to atherosclerosis.

Unsaturated fats, polyunsaturated and monounsaturated are beneficial for heart health. They are present in fish, nuts, seeds and vegetables.

The essential fatty acids omega-3 and omega-6 are found in oily fish and in nuts and seeds. Our bodies cannot make these acids so we have to eat them to gain their benefits, which include improving cholesterol levels in the body.

But it is important to note that if your total fat intake is greater than 37% of your total calories, then even if that fat is unsaturated you increase your risk of cardiovascular disease. Saturated fat intake should not exceed 10% of total energy and for high-risk groups, like people with diabetes, total fat intake should be 7% or less of total energy.

Sodium

High blood pressure (hypertension) is a major risk factor for cardiovascular disease. If you have a diet high in sodium you risk hypertension.

It has been estimated that a universal reduction in dietary intake of sodium by about 1g of sodium a day, about 3g of salt, would lead to a 50% reduction in the number of people needing treatment for hypertension. The same decrease would lead to a 22% drop in the number of deaths resulting from strokes and a 16% fall in the number of deaths from coronary heart disease.

Fruits and vegetables

Eating a diet high in fresh fruits and vegetables protects your heart. Low fruit and vegetable intake accounts for about 20% of cardiovascular disease worldwide. Fruit and vegetables contain components that protect against heart disease and stroke.

Wholegrain cereals

Whole grains are unrefined and do not have the bran or germ removed. They contain folic acid, B vitamins and fiber, all of which are important protectors against heart disease. Processed grains like that used to make white bread and pasta do not have the same benefits as wholegrain cereals.

Fish

In countries where fish consumption is high there is a reduced risk of death from all causes as well as cardiovascular mortality.

Nuts

Eating nuts regularly is associated with decreased risk of coronary heart disease.

Soy

There is evidence that soy has a beneficial effect on blood lipid levels. Eating 47g of soy protein a day led to a 9% drop in total cholesterol and a 13% reduction in LDL cholesterol in one study of people without any heart disease.

Alcohol

If you have the occasional drink you may protect your heart, but only if you drink in moderation.

Diet for Obesity:

The optimal management of overweight and obesity requires a combination of diet, exercise and behavioral modification. In addition, some patients eventually require pharmacologic therapy or bariatric surgery. The risk of overweight to the subject should be evaluated before beginning any treatment program. Selection of treatment can then be made using a risk-benefit assessment. The choice of therapy is dependent on several factors including the degree of overweight or obesity and patient preference.

Most people will need to reduce their daily kilojoule intake in order to lose weight. This means eating and drinking less and making healthier food choices. One way to do this is to swap unhealthy and high energy food choices such as fast food, processed food and sugary drinks (including alcohol) for healthier choices.

a) Enjoy a wide variety of nutritious foods from these five groups every day:

- Plenty of vegetables, including different types and colours, and legumes/beans
- Fruit
- Grain (cereal) foods, mostly wholegrain and/or high cereal fibre varieties, such as bread, cereals, rice, pasta, noodles, polenta, couscous, oats, quinoa and barley
- Lean meats and poultry, fish, eggs, tofu, nuts and seeds, and legumes/beans
- Milk, yoghurt, cheese and/or their alternatives, mostly reduced fat (reduced fat milks are not suitable for children under 2 years)

b) Drink plenty of water.

c) Limit intake of foods containing saturated fat, added salt, added sugars and alcohol.

Avoid fad diets

Avoid fad diets that recommend unsafe practices such as fasting (going without food for long periods of time) or cutting out entire food groups such as meat, fish, wheat or dairy products.

These are not sustainable, can make you feel ill, and may cause unpleasant side effects such as bad breath, diarrhoea and headaches.

This is not to say that all commercial diet programmes are unsafe. Many are based on sound medical and scientific principles and can work well in some people.

Choose a responsible diet programme that:

- educates you about issues such as portion size, making changes to long-term behaviour and healthy eating
- is not overly restrictive in terms of the type of food you can eat

- is based on achieving gradual sustainable weight loss rather short-term rapid weight loss, which is unlikely to last

Very low calorie diet

A very low calorie diet (VLCD) is a diet that involves consuming less than containing less than 3350 kilojoules (800 calories) per day.

While a VLCD can be an effective method of losing weight for some obese people, is it not a suitable or safe method for everyone. It would usually only be recommended if rapid weight loss was required to reduce the risk of an obesity-related complication such as heart disease, or if you have failed to lose weight despite conventional treatment. You should only ever undertake a VLCD under the supervision of a suitably qualified health professional.

Diet for Arteriosclerosis:

Arteriosclerosis is the stiffening or hardening of the artery walls while **Atherosclerosis** is the narrowing of the artery because of plaque build-up.

Arteriosclerosis characterized by irregularly distributed lipid deposits in the intima of large and medium-sized arteries, causing narrowing of arterial lumens and proceeding eventually to fibrosis and calcification. Lesions are usually focal and progress slowly and intermittently. Limitation of blood flow accounts for most clinical manifestations, which vary with the distribution and severity of lesions. In lower animals, atherosclerosis of swine and fowl closely resemble human atherosclerosis.

Atherosclerosis or arteriosclerotic vascular disease is a condition where the arteries become narrowed and hardened due to an excessive build up of plaque around the artery wall. The disease disrupts the flow of blood around the body, posing serious cardiovascular complications.

A proper diet is the best way to prevent the development of arteriosclerosis. In the diet of arteriosclerosis should consider the following tips:

Diet for Arteriosclerosis

- d) Food rich in Omega 3 and fibre : Flaxseed and chia, Quinoa, Lentils and chickpeas, Brown bread and whole rice
- e) Vitamin C, lycopene, betacarotene : Carrots, oranges and mangoes, Peppers and tomato sauce
- f) Vegetables (Fibres and folic acids)
- g) Onion and garlic

Food for Arteriosclerosis:

A vegetarian diet, rich in natural plant foods , is the best way to avoid the appearance of this disease.

This diet should be rich in vegetables which provide much needed components for healthy arteries.

Vegetables are high in fiber, particularly soluble fiber that has the ability to limit cholesterol absorption and many toxins that can damage arteries. Both cholesterol and toxic substances are trapped in the fiber that vegetables provide and are tossed out through the feces before being absorbed by the body.

It has been shown that deficiency of vitamin B6, vitamin E and methionine, magnesium, and selenium deficiency are most responsible for reducing the flow of blood, making it a more viscous liquid. Most vegetables contain vitamin B6 and legumes are rich in vegetable protein with a high content of methionine.

In this way the vegetables can be an alternative to other foods of animal origin which are rich in protein as beef and lamb, but at the same time they contain too much cholesterol, the main cause of atherosclerosis.

Eating foods rich in potassium and low in sodium will help eliminate excessive body water, reducing the sodium level which will help to lower blood pressure. Among the foods richest in potassium we can choose potatoes, kiwis, bananas, tomatoes, peaches or grapes.

Eating vegetables means eating many antioxidants, which are responsible for the oxidation of the cells of arteries and can support the development of this disease. Among the most important antioxidants of vegetables the most important ones are vitamin A, that plants provide in the form of beta carotene, which the body converts into vitamin A.

Plants that contain provitamine A are specially dark green, orange, red or yellow food plants, such as carrots, purslane, spinach, watercress and borage.

Other plants that contain it are, for example, basil, squash, tomatoes, coriander, asparagus, dandelion, peppers, watermelon, melon, Brussels sprouts, bananas, apples, plums, oranges, raspberries, mangos, beans, etc.

No less important is the vitamin C as an antioxidant. Present in many plant foods but especially in citrus fruits (oranges, lemons, tangerines, etc.) A morning daily glass of orange juice or lemon is one of the best medicines to prevent hardening of the arteries.

Peppers are very rich in this vitamin. Other plants that contain this vitamin include cauliflowers, radishes, Brussels sprouts, spinach, bananas, apples, melons, watermelons, carrots, pineapples, pears, papayas, barley, garlic, berries, celery, peas, strawberries, grapes, figs, beans, chicory, blueberries, potatoes, avocados, soybeans, cherimoyas, pomegranates, coconuts, etc.

Complete the vegetarian food with oily fish

Oily fish is rich in omega 3 fatty acids that can increase good cholesterol "HDL" and counteract the negative effects that "bad" cholesterol (LDL) provides. The main fish that contain this component are sardines, herring, tuna, salmon, etc.

Super foods for Arteriosclerosis:

The best foods that should become part of the staple diet of arteriosclerosis are:

i) Onions : For its component contents blood thinners.

ii) Garlic : As onion is a good a blood thinner.

iii) Soybean: The soybean for its content in lecithin and other components: Soy is a very interesting food for circulation. It has been established as the replacement of animal protein, this food may reduce by 20% the rate of cholesterol in the blood.

The isoflavone genistein not only helps reduce bad cholesterol (LDL) and triglycerides, but also improves overall circulation by increasing the flexibility of the arteries and make blood flow more easily.

In addition to isoflavones also involved in this property its content in omega-3 fatty acids. This may explain why vegetarians, often consuming soy, have more flexible and young arteries than people eating all kind of food.

However, the cardiovascular properties of this food are not only useful for people who only eat vegetables. It has been shown as people who eat meat frequently have their cholesterol levels reduced or not increased when they include a daily ration of this legume in the diet. Somehow this food counteracts the negative effects of the cholesterol of animal flesh.

iv) Ginger: Ginger constitutes a good resource to favor blood circulation. It helps to dissolve blood clots in the arteries and diminish the levels of cholesterol in blood. By making blood more fluid it helps to prevent a series of vascular accidents, such as heart attacks, angina pectoris or thrombosis.

Its use prevents heart attacks, angina pectoris or thrombosis. It can constitute a natural alternative to conventional treatments, such as aspirin (Eat it together with other foods, especially with onion and garlic) For those who find it to "punchy" may take it in form of supplements (Take 3 capsules of 250 mg a day, distributed among the main meals) (Look for contraindications or toxicity in the general study of the plant)

v) Walnuts: They are extremely interesting for their vegetable polyunsaturated fats. Although, as olive oil, they contain oleic acid (monounsaturated) which has proved very effective and reliable in the reduction of the levels of cholesterol in blood, their wealth in linoleic and alpha-linoleic acids (polyunsaturated) confer them more interesting properties to reduce this component and to prevent illnesses of the circulatory system that affect to our heart and arteries.

vi) Pepper (*Piper nigrum*): Due to its fluidizing properties for the blood, black pepper is used to treat arteriosclerosis and to prevent blood clotting (Add pepper to your food. Max. 5 gm daily)

Nuts constitute a good source of vitamin E with antioxidant properties, so they will be very effective to avoid the negative influence of free radicals in arteries.

vii) Foods with high soluble fiber content: Choosing foods high in soluble fiber hinders the absorption of cholesterol through the intestinal wall, so that a diet rich in vegetables containing a lot of soluble will help reduce all those diseases related with cholesterol. Foods containing high levels of this component are oats, beans, pears or apples.

Non Adequate foods for Arteriosclerosis:

i) Avoid eating canned food: Canned food should be avoided, either from animal or vegetable origin, because of its high sodium content.

ii) Avoid eating red meat and fried foods. These foods are rich in cholesterol and should be avoided or eaten very gently to prevent the onset of atherosclerosis. In case of disease is better to refuse them.

iii) Avoid eating foods high in sugar because they promote obesity and thicken the blood. Among these natural juices are included , whose consumption should be restricted and limited to half a liter a day, diluted and divided into several doses.

iv) Can you take alcohol? A very moderate alcohol consumption can help improve circulation. However, we should not become accustomed to their intake to avoid the risk of alcoholism.

v) Coffee and arteriosclerosis? / Tea and arteriosclerosis? : Coffee acts on the liver, increasing cholesterol levels. Not so with the tea, which can be taken, especially green tea that it is very suitable for circulatory diseases. Both of them contain high amounts of caffeine, but it seems that, apart from caffeine, there must be some other components in coffee that make it not suitable for arteriosclerosis.

Green tea diminishes cholesterol, makes blood more fluid, energizes the heart and protects it from angina pectoris or heart attack. Histidine constitutes a good antiarteriosclerotic. Theanine, an amino-acid that can only be found in this plant, realizes the same function, beside avoiding the formation of thrombus or blood clots, a property also accomplished by eugenol. Theobromine is a vasodilator and cardiogenic.

vi) Eggs for arteriosclerosis? Egg yolk contains a lot of cholesterol, but the white of an egg is rich in lecithin which counteracts in part the content of the yolk. Moderate consumption of eggs (One or two a week) should not harm the person suffering from arteriosclerosis or favor its appearance)

Diet for Kidney Diseases :

When you have chronic kidney disease, you need to make changes in your diet, including:

- Limiting fluids
- Eating a low-protein diet (this may be recommended)
- Restricting salt, potassium, phosphorous, and other electrolytes
- Getting enough calories if you are losing weight

Your recommended diet may change over time if your kidney disease gets worse, or if you need dialysis.

Function

The purpose of this diet is to maintain a balance of electrolytes, minerals, and fluid in patients who have chronic kidney disease or who are on dialysis. Patients who are on dialysis need this special diet to limit the buildup of waste products in their body. These waste products can also build up between dialysis treatments.

Most dialysis patients urinate very little or not at all. Limiting fluids between treatments is very important. Without urination, fluid will build up in the body and lead to excess fluid in the heart, lungs and ankles.

Recommendations

i) Carbohydrates:

If you are overweight or have diabetes, you may need to limit the amount of carbohydrates you eat. Talk with your doctor, nurse, or dietitian.

Otherwise, carbohydrates are a good source of energy for your body. If your health care provider has recommended a low-protein diet, you may replace the calories from protein with:

- Fruits, breads, grains, and vegetables. These foods provide energy, as well as fiber, minerals, and vitamins.
- Hard candies, sugar, honey, and jelly. If needed, you can even eat high-calorie desserts such as pies, cakes, or cookies, as long as you limit desserts made with dairy, chocolate, nuts, or bananas.

ii) Fats:

Fats can be a good source of calories. Make sure to use monounsaturated and polyunsaturated fats (olive oil, canola oil, safflower oil) to help protect your arteries. Talk to your doctor, nurse, or dietitian about fats and cholesterol that may increase your risk for heart problems.

iii) Protein:

Low-protein diets may be helpful before you start dialysis. Your doctor or dietitian may recommend a moderate-protein diet (1 gram of protein per kilogram of body weight per day).

Once you start dialysis, you will need to eat more protein. In fact, a high-protein diet with fish, poultry, pork, or eggs at every meal may be recommended. This will help you replace muscles and other tissues that you lose.

People on dialysis should eat 8 - 10 ounces of high-protein foods each day. Your doctor, dietitian, or nurse may suggest adding egg whites, egg white powder, or protein powder.

iv) Calcium and Phosphorous:

Calcium and phosphorous, two other important minerals in the body, are also monitored closely. Even in the early stages of chronic kidney disease, phosphorous levels in the blood can become too high. This can cause:

- Low calcium (this causes the body to pull calcium from your bones, which can make your bones weaker and more likely to break)
- Itching

You will need to limit the amount of dairy foods you eat, because they contain large amounts of phosphorous. This includes milk, yogurt, and cheese. Some dairy foods are lower in phosphorous, including tub margarine, butter, cream cheese, heavy cream, ricotta cheese, brie cheese, sherbet, and nondairy whipped toppings.

Fruits and vegetables contain only small amounts of phosphorous, but may contain large amounts of potassium.

You may need to take calcium supplements to prevent bone disease, and vitamin D to control the balance of calcium and phosphorous in your body. Ask your doctor, nurse, or dietitian.

If diet changes to lower phosphorous are not enough, your doctor may recommend "phosphorous binders."

v) Fluids:

In the early stages of chronic kidney disease, you do not need to limit how much fluid you drink. As your kidney disease becomes worse or when you are on dialysis, you will need to watch how much liquid you drink. In between dialysis sessions, fluid can build up in the body. Too much fluid will lead to shortness of breath, an emergency that needs immediate medical attention.

Your doctor and dialysis nurse will let you know how much you should drink every day. Do not eat too much of foods that contain a lot of water, such as soups, Jell-O, popsicles, ice cream, grapes, melons, lettuce, tomatoes, and celery.

Use smaller cups or glasses and turn over your cup after you have finished it.

- Avoid salty foods
- Freeze some juice in an ice cube tray and eat it like a popsicle (you must count these ice cubes in your daily amount of fluids)
- Stay cool on hot days

vi) Salt or Sodium:

Reducing sodium in your diet helps you control high blood pressure, keeps you from being thirsty, and prevents your body from holding onto extra fluid. You will probably need to eat a low-salt diet.

Look for these words on food labels:

- Low-sodium
- No salt added
- Sodium-free
- Sodium reduced
- Unsalted

Check all labels to see how much salt or sodium foods contain per serving. Also, avoid foods that list salt near the beginning of the ingredients. Look for products with less than 100 mg of salt per serving.

DO NOT use salt when cooking and take the salt shaker away from the table. Most other herbs are safe and you can use them to flavor your food instead of salt.

DO NOT use salt substitutes because they contain potassium. People with chronic kidney disease also need to limit their potassium.

vii) Potassium:

Normal blood levels of potassium help keep your heart beating steadily. However, too much potassium can build up when the kidneys no longer function well. Dangerous heart rhythms may result, which can lead to death.

Potassium is found in many food groups, including fruits and vegetables. Choosing the right item from each food group can help control your potassium levels.

When eating fruits:

- Choose peaches, grapes, pears, cherries, apples, berries, pineapple, plums, tangerines, and watermelon
- Limit or avoid oranges and orange juice, nectarines, Kiwis, raisins or other dried fruit, bananas, cantaloupe, honeydew, prunes, and nectarines

When eating vegetables:

- Choose broccoli, cabbage, carrots, cauliflower, celery, cucumber, eggplant, green and wax beans, lettuce, onion, peppers, watercress, zucchini, and yellow squash
- Limit or avoid asparagus, avocado, potatoes, tomatoes or tomato sauce, winter squash, pumpkin, avocado, and cooked spinach

viii) Iron:

Patients with advanced kidney failure also have anemia \ and usually need extra iron.

Many foods contain extra iron (liver, beef, pork, chicken, lima and kidney beans, iron-fortified cereals). Because of your kidney disease, talk this over with your doctor, nurse, or dietitian.

Diet for Peptic Ulcer:

A peptic ulcer is a sore in the inner lining of the stomach or upper small intestine (duodenum). Ulcers develop when the intestine or stomach's protective layer is broken down. When this happens, digestive juices can damage the intestine or stomach tissue. These strong juices, which

contain hydrochloric acid and an enzyme called pepsin, also can injure the esophagus. The esophagus is the tube that leads from your throat to your stomach.

Peptic ulcers are no longer a condition that most people have to live with their entire lives. Treatment cures most ulcers. And symptoms go away quickly.

Peptic ulcers that form in the stomach are called gastric ulcers. Those that form in the upper small intestine are called duodenal ulcers.

The best diet for people with peptic ulcer disease is one that is healthy and balanced.

- Eating more often and eating diets with extra milk or dairy are NOT helpful and may even cause more stomach acid.
- Avoid foods that cause problems or discomfort for you. Most often, this list may include alcohol, coffee, caffeinated soda, fatty foods, chocolate, and spicy foods.
- Avoid late night snacks.

Other lifestyle tips that may help your ulcer healed and your symptoms better are:

- If you smoke or chew tobacco, try to quit. Tobacco will slow the healing of your ulcer and make it more likely that the ulcer will come back. Your doctor can help.
- Reduce your stress and watch for stressful, tense times. Stress can bother your reflux problem.

Avoid drugs such as aspirin, ibuprofen (Advil, Motrin), or naproxen (Aleve, Naprosyn). Take acetaminophen (Tylenol) to relieve pain. Take any of your medicines with plenty of water.

Diet for Anemia:

Anemia is a condition that develops when your blood lacks enough healthy red blood cells or hemoglobin. Hemoglobin is a main part of red blood cells and binds oxygen. If you have too few or abnormal red blood cells, or your hemoglobin is abnormal or low, the cells in your body will not get enough oxygen. Symptoms of anemia -- like fatigue -- occur because organs aren't getting what they need to function properly.

Low levels of vitamins or iron in the body can cause some types of anemia. These low levels may be due to poor diet or certain diseases or conditions.

To raise your vitamin or iron level, your doctor may ask you to change your diet or take vitamin or iron supplements. Common vitamin supplements are vitamin B12 and folic acid (folate). Vitamin C sometimes is given to help the body absorb iron.

a) Iron:

Your body needs iron to make hemoglobin. Your body can more easily absorb iron from meats than from vegetables or other foods. To treat your anemia, your doctor may suggest eating more meat especially red meat (such as beef or liver), as well as chicken, turkey, pork, fish, and shellfish.

Nonmeat foods that are good sources of iron include:

- Spinach and other dark green leafy vegetables
- Tofu
- Peas; lentils; white, red, and baked beans; soybeans; and chickpeas
- Dried fruits, such as prunes, raisins, and apricots
- Prune juice
- Iron-fortified cereals and breads

You can look at the Nutrition Facts label on packaged foods to find out how much iron the items contain. The amount is given as a percentage of the total amount of iron you need every day.

Iron also is available as a supplement. It's usually combined with multivitamins and other minerals that help your body absorb iron.

Doctors may recommend iron supplements for premature infants and infants who are fed breast milk only or formula that isn't fortified with iron.

Large amounts of iron can be harmful, so take iron supplements only as your doctor prescribes.

b) Vitamin B12:

Low levels of vitamin B12 can lead to pernicious anemia. This type of anemia often is treated with vitamin B12 supplements.

Good food sources of vitamin B12 include:

- Breakfast cereals with added vitamin B12
- Meats such as beef, liver, poultry, and fish
- Eggs and dairy products (such as milk, yogurt, and cheese)
- Foods fortified with vitamin B12, such as soy-based beverages and vegetarian burgers

c) Folic Acid:

Folic acid (folate) is a form of vitamin B that's found in foods. Your body needs folic acid to make and maintain new cells. Folic acid also is very important for pregnant women. It helps them avoid anemia and promotes healthy growth of the fetus.

Good sources of folic acid include:

- Bread, pasta, and rice with added folic acid
- Spinach and other dark green leafy vegetables
- Black-eyed peas and dried beans
- Beef liver
- Eggs
- Bananas, oranges, orange juice, and some other fruits and juices

d) Vitamin C:

Vitamin C helps the body absorb iron. Good sources of vitamin C are vegetables and fruits, especially citrus fruits. Citrus fruits include oranges, grapefruits, tangerines, and similar fruits. Fresh and frozen fruits, vegetables, and juices usually have more vitamin C than canned ones.

If you're taking medicines, ask your doctor or pharmacist whether you can eat grapefruit or drink grapefruit juice. This fruit can affect the strength of a few medicines and how well they work.

Other fruits rich in vitamin C include kiwi fruit, strawberries, and cantaloupes.

Vegetables rich in vitamin C include broccoli, peppers, Brussels sprouts, tomatoes, cabbage, potatoes, and leafy green vegetables like turnip greens and spinach.

Diet for Gastrointestinal Diseases:

Gastrointestinal graft-versus-host disease (also known as GI GVHD) can cause nausea, vomiting, abdominal pain and diarrhea. Protein loss can be high, resulting in the need for a protein-rich diet.

If a patient has large amounts of diarrhea, the doctor may ask the patient not to eat or drink for several days to allow the gastrointestinal tract to rest. When eating is restarted, the patient may best tolerate a diet that is low in fat, low in lactose (milk sugar), low in insoluble fiber and low in acidic foods.

The Gastrointestinal Diet 1 and Gastrointestinal Diet 2:

The Gastrointestinal Diet 1 (GI 1 diet) and Gastrointestinal Diet 2 (GI 2 diet) are designed to reduce GI discomfort (such as abdominal pain, nausea, vomiting and diarrhea) after eating. The diets are based on the following guidelines:

- **Low fat:** Fats are hard to digest and can increase diarrhea.
- **Low fiber:** Certain fibers (insoluble fibers, such as in whole wheat products) can increase diarrhea or gas. However, the fibers allowed in the GI 2 diet (soluble fibers, such as apples and pears) help to form stools.
- **Low lactose:** Dairy products contain a sugar called lactose that may be hard to digest during GI illness. Signs of poor digestion are bloating, gas, abdominal cramping and diarrhea. Lactose-free milk is available as a substitute for regular milk. Talk with your dietitian about use of oral lactase enzyme tablets with other dairy products.
- **Low acid and irritants:** Foods that are high in acid or spicy can irritate the mouth, stomach or GI tract.

Starting the GI 1 or GI 2 Diet:

The following are recommended as you start the GI diets:

- Carbohydrate-rich and protein-rich foods are easier for your body to digest than high-fat foods. Limit fatty foods to three servings each day to start with.
- Limit meal size. Smaller, more-frequent meals are easier to digest.

- Try one new food at a time. Wait at least three hours before trying another new food.
- If your GI symptoms (abdominal pain, nausea, vomiting or diarrhea) increase, do not eat the most recently introduced food again. Tell your dietitian, nurse or doctor about your symptoms.

Progressing on the GI 1 and GI 2 Diets:

The GI 1 diet does not provide all of the nutrients a person needs to remain healthy. If it is to be followed for longer than one week, other nutrition support should be considered. The GI 1 diet should be used to reacquaint a patient with easily digested foods and to assess a patient's tolerance to these foods. The patient should start with the foods listed in the top table ("Foods to Try First"). Once the patient has tolerated the GI 1 beverages, cereals, starches and fruits for a few days, the foods in the second table ("If Tolerated, Try") should be tried and tolerance of the items assessed. When the GI 1 diet has been tolerated without worsening GI symptoms, the patient may progress to the GI 2 diet.

The GI 2 diet offers a greater variety of foods. It can provide adequate nutrition and so may be continued for a long period of time.

Each person is different. What may be best for you may not be best for someone else. The rate of progressing from the GI 1 to the GI 2 diet and then to a general diet varies between people. The decision to advance the diets is based on each patient's GI symptoms. You should work with a dietitian while progressing on the GI diets to help ensure that nutrients needs are being met. Your dietitian can give you additional guidelines based on your specific needs.

Gastrointestinal Diet 1:

In this diet, all foods must be selected and prepared according to Immuno-suppressed Patient Diet.

Gastrointestinal Diet 2:

This diet is designed to reduce gastrointestinal "GI" discomfort (abdominal pain, nausea, vomiting, diarrhea) after eating.

The Bland Diet for Gastrointestinal Disorders:

The bland diet, also referred to as the soft diet, is created specifically to decrease peristalsis and to avoid irritation of the gastrointestinal tract. It can be beneficial for people with peptic ulcer disease, chronic gastritis, reflux esophagitis and dyspepsia. It is also used occasionally in the treatment of hiatal hernia. The bland diet can also be helpful for those experiencing occasional nausea or vomiting. It is designed primarily to help patients recover from these conditions or other medical circumstances in which improved digestion would be essential. Even though portion sizes are strictly controlled, the bland diet is not particularly effective as a long-term weight loss diet. Many people find the bland diet to be very difficult to maintain. The use of acceptable spice alternatives can help to make the diet easier. Most patients will slowly return to a more normal diet once their medical issues have been resolved.

The Bland Diet:

The bland diet consists of foods that are easily digestible, seasoned mildly, low in fiber and acidity, and tender. The diet eliminates fried foods, highly seasoned foods, and most raw or gas-forming fruits and vegetables. Drinks containing alcohol and Xanthine are also to be avoided. In order to maintain a balanced diet, an appropriate number of servings allowed for each food group should be consumed on a daily basis.

Foods to Include

- All milk and milk products
- All fats and oils
- Mild cheeses and cottage cheese
- Cooked, frozen, or canned vegetables
- Lettuce in small amounts
- Cooked or canned fruit without skins, seeds or tough fibers
- Avocado, banana, and citrus without membrane
- All lean, tender meats, poultry, fish and shellfish
- Eggs
- Smooth nut butters
- Tofu and other meat substitutes
- Mildly seasoned meat stock, broth bouillon, or cream soups made with allowed foods
- Butter or fortified margarine
- Mild salad dressings such as mayonnaise, French or vinegar and oil
- White, refined wheat, and seedless rye breads
- Plain white rolls, white melba toast, matzo, english muffin, bagel, pita bread, and tortilla
- Couscous
- Saltine, graham, soda or plain crackers
- Cooked, refined cereals such as cream of wheat, oatmeal, farina, and cream of rice
- Dry corn and rice cereals such as puffed rice or corn flakes
- Potatoes
- Enriched rice, barley, noodles, spaghetti, macaroni, and other pastas
- Pepper, herbs, spices, ketchup, mustard and vinegar in moderation
- Sugar, syrup, honey, jelly, hard candies, plain chocolate, molasses and marshmallows
- Iodized salts
- Cakes, cookies, pies, puddings, custard, ice cream, sherbet, and Jell-O made with allowed foods
- Herb teas
- Fruit juices and mildly flavored vegetable juices

Foods to Avoid

- Raw vegetables, dried peas, beans and corn
- Gas forming vegetables such as broccoli, brussel sprouts, cabbage, onions, cauliflower, cucumber, green pepper, rutabagas, turnips and sauerkraut
- Berries and figs
- Whole grain and coarse cereals such as bran
- Seeds in or on breads and crackers
- Bread or bread products with nuts or dried fruit
- Potato chips, fried potatoes, and wild rice
- Highly seasoned, cured or smoked meats
- Poultry or fish such as corned beef, luncheon meats, frankfurter and other sausages
- Sardine anchovies
- Strong flavored cheeses
- Chunky peanut butter
- Highly seasoned salad dressings with seeds or pickle relish
- All sweets and desserts containing nuts, coconut or fruit
- Fried pastries, such as doughnuts
- Caffeinated beverages
- Alcoholic beverages
- Carbonated beverages
- Strongly flavored seasonings and condiments such as garlic, barbecue sauce, chili sauce, chili pepper, horse radish, pepper and chili powder
- Pickles, seed spices olives



PRINTING AREA
ISSN-2394-5303

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