What you'll learn

- Understand the fundamentals of proper nutrition.
- Understand what the Macronutrients are and the role they play in our bodies.
- Understand the role Micronutrients, Fiber, Probiotics & Water play in our bodies.
- Learn the sources of Carbohydrates/Proteins/Fat and figure out their estimated daily requirements.
- Understand the fundamentals of Meal planning and Food exchange list.
- Understand the nutrition in 5 basic stages of lifecycle - Pregnancy, infancy, childhood, Adolescence, Adulthood.

- Identify the psychology of behavioral change and how to motivate your clients to achieve their goals and prevent relapse.

- Apply principles from the various facets of food science and related disciplines to solve practical as well as real-world problems.

- Feel confident as a health and nutrition coach because you have developed a strong foundation both of theory and practical application

MODULES

MODULE 1 - FUNDAMENTALS OF NUTRITION

Lesson 1 - Nutrition Science : Basic Concepts

Lesson 2 - Nutrients in the food and in the body.

Lesson 3 - Nutritional requirement and Basic terminology in relation to Nutritional Requirement

Lesson 4 - Nutritional Assessment

Lesson 5 - Diet and Health.

Lesson 2

Nutrients in the food and in the body

Lesson 1

Nutrition science

MODULE 1

Lesson 3

Nutritional requirement and Basic terminology in relation to Nutritional Requirement

Lesson 5

Diet and Health.

Lesson 4

Nutritional Assessment

Lesson 1 - Nutrition science

Nutrition science is simply defined as the knowledge regarding the role of food in maintaining good health.

In other words, Nutritional Science is the study of food, nutrients, and other food substances, the intake and biochemical processing of food substances, their relationship to health and disease, and the application of this information to policy and programs.

The next question that would arise is how we will define good health, can good health be referred to as positive health or does it merely mean freedom from diseases or is it more than that let us see.

According to WHO - Good Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

To maintain good health we must combine and consume a variety of food in such a way that the nutrients needed by the body must be provided.

understanding nutritional needs and translating this into practical diets is no longer a simple process but requires a sound knowledge of nutrition. 1st we need to review are nutritional components of the food that we eat so let's start

Nutritional Components of the food we consume are

1. carbohydrates
2. proteins
3. lipids
4. water
5. minerals
6. vitamins
7. fibre
8. phytochemicals and anti oxidants
9. detoxifying agents

If these nutritional components are consumed daily in the amounts and the proportion required then the chances are that we will maintain good health.

Therefore a good knowledge and understanding of the food sources of these various nutritional components, their metabolism and their requirements for different age and physiological groups is an essential prerequisite for maintaining good health.
This course is an attempt to provide this knowledge and skills.

Food is the very basis of our life.The food we eat through the process of digestion is converted into nutrients and these nutrients are absorbed,transported to different parts of the body and utilized for the day-to-day functioning - at the end of which they're disposed of by further metabolism and transformation into the end products.
we need to consume our variety of foods in order to remain healthy.

A simple thumb rule is to classify foods into different food groups.The basic 7 food groups are

1. cereals and cereals products

2. pulses (also meat and meat products)

3. milk and milk products

4. vegetable and fruits

5. nuts and oil

6. fats and oils

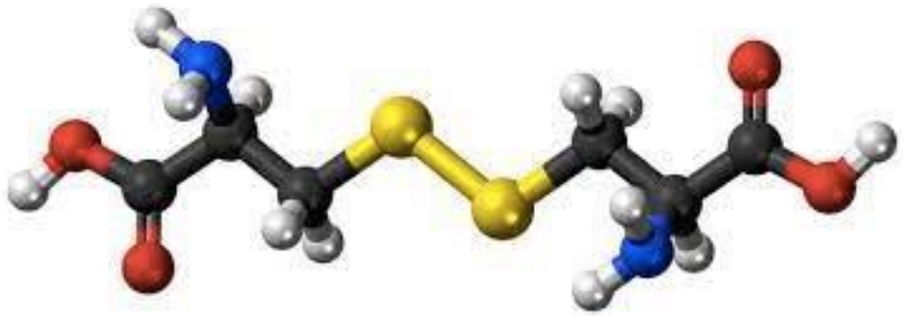
7. sugars

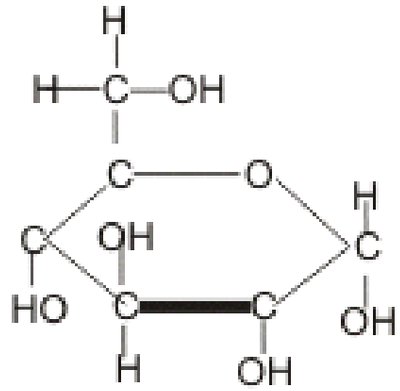
We all have to make conscious efforts to have a healthy diet. If you are a nutrition professional or a dietitian then you can plan the d, et for others both for health and in disease and in addition you will be counselling a large number of people on appropriate diet.

This module will further help you in understanding the basic understanding of nutritional requirement.

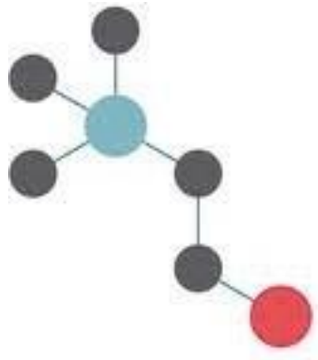
Lesson 2 - Nutrients in the food and the body

What are nutrients ?



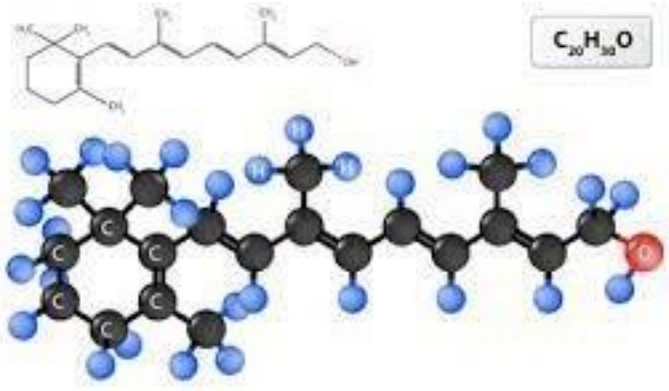


Glucose

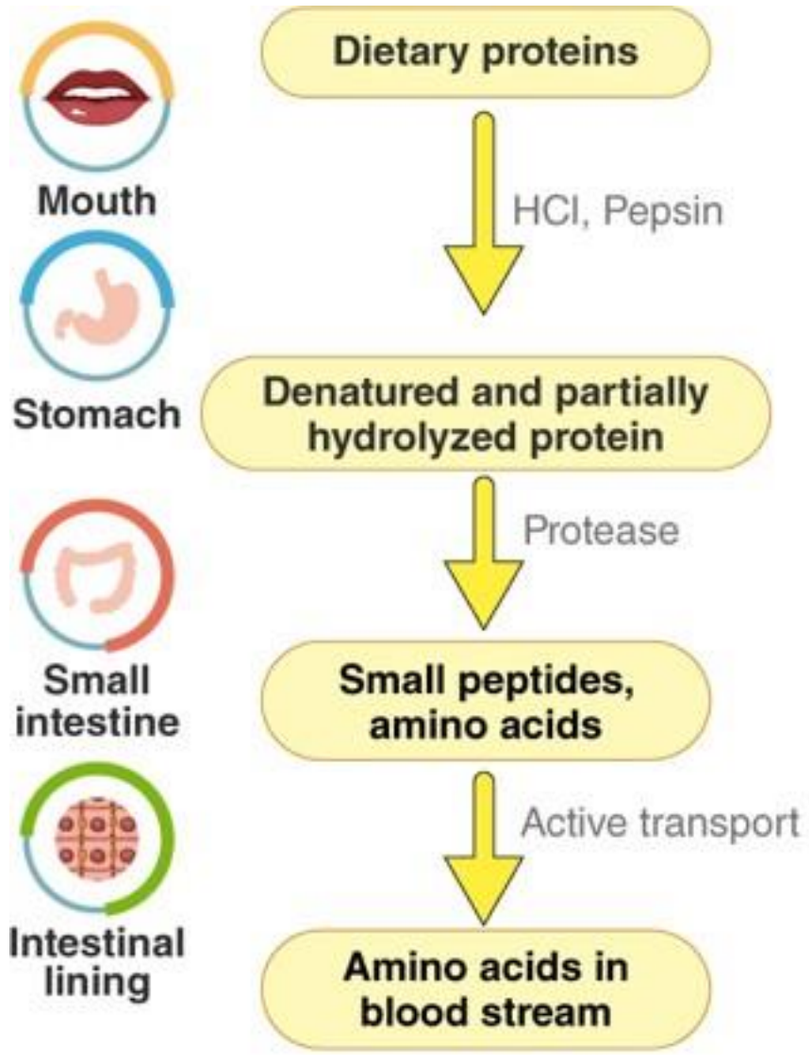


choline

Vitamin A (retinol)



Example :


Dietary proteins
HCl, Pepsin
Mouth
Stomach
Denatured and partially hydrolyzed protein
Protease
Small intestine
Small peptides, amino acids
Active transport
Intestinal lining
Amino acids in blood stream
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TYPES OF NUTRIENTS

Macronutrients

- Carbohydrates
- Proteins
- Fats

Micronutrients

- Vitamins
- Minerals

Water

Functions of nutrients

Energy

Helps in building and repairing

provides structure to blood vessels, bones and ligaments

regulates many chemical processes

Lesson 3 - Nutritional requirement and Basic terminology in relation to Nutritional Requirement

What is Nutritional requirement ?

- **The amount of each nutrient needed in the human body is called the nutritional requirement.**

- **These are different for each nutrient and also vary between individuals and life stages**

Factors on which Nutritional requirement depends

- Age
- Sex
- Bodyweight
- Individual bioavailability
- Bioavailability of nutrients

Basic terminology in relation to Nutritional Requirement

RDA - Recommended Dietary Allowance

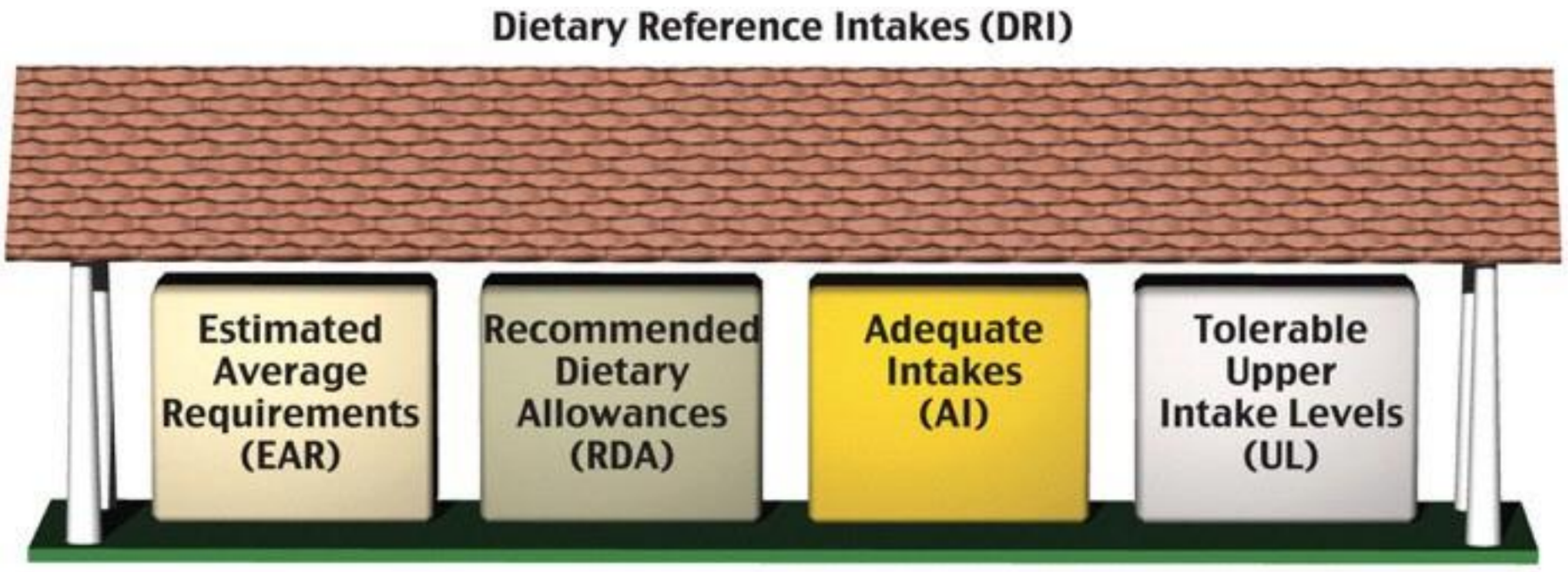
RECOMMENDED DIETARY ALLOWANCES FOR INDIANS

Group	Particulars	Body weight kg	Net energy Kcal/d	Protein g/d	Visible fat g/day	Calcium mg/d	Iron mg/d	Vitamin µg/kg		Thiamine mg/d	Riboflavin mg/d	Nicotinic acid mg/d	Pyridoxine mg/d	Ascorbic acid mg/d	Free folic acid µg/d	Vit B12 µg/d
								Retinol	β carotene							
Man	Sedentary work	60	2425	60	20	400	28	600	2400	1.2	1.4	16	2.0	40	100	1
	Moderate work		2875							1.4	1.6	18				
	Heavy work		3900							1.6	1.9	21				
Woman	Sedentary work	50	1875	50	20	400	30	600	2400	0.9	1.1	12	2.0	40	100	1
	Moderate work		2225							1.1	1.3	14				
	Heavy work		2925							1.2	1.5	16				
	Pregnant woman	50	+ 300	+15	30	1000	38	600	2400	+0.2	+0.2	+2	2.5	40	400	1
	Lactation															
	0-6 months	50	+550	+25	45	1000	30	950	3800	+0.3	+0.3	+4	2.5	80	150	1.5
	6-12 months		+400	+18						+0.2	+0.2	+3				
Infants	0-6 months	5.4	108/kg	2.05/kg		500		350	1200	55µg/kg	65µg/kg	710µg/kg	0.1	25	25	0.2
	6-12 months	8.6	98/kg	1.65/kg						50µg/kg	60µg/kg	650µg/kg	0.4			
Children	1-3 years	12.2	1240	22	25	400	12	400	1600	0.6	0.7	8	0.9	40	30	0.2-1.0
	4-6 years	19.0	1690	30			18	400		0.9	1.0	11			40	
	7-9 years	26.9	1950	41			26	600	2400	1.0	1.2	13	1.6		60	
Boys	10-12 years	35.4	2190	54	22	600	34	600	2400	1.1	1.3	15	1.6	40	70	0.2-1.0
Girls	10-12 years	31.5	1970	57			19			1.0	1.2	13				
Boys	13-15 years	47.8	2450	70	22	600	41	600	2400	1.2	1.5	16	2.0		100	0.2-1.0
Girls	13-15 years	46.7	2060	65			28			1.0	1.2	14				
Boys	16-18 years	57.1	2640	78	22	600	50	600	2400	1.3	1.6	17	2.0	40	100	0.2-1.0
Girls	16-18 years	49.9	2060	63			30			1.0	1.2	14				

Source - ICMR

DRI - Dietary reference Intake

Dietary Reference Intakes (DRI) are the recommendation levels for specific nutrients and consist of a number of different types of recommendations. This DRI system is used in both the United States and Canada.



The most recent recommendations from the Food and Nutrition Board are the "Dietary Reference Intakes" (DRI). The DRI include 4 sets of standards:

1. **Recommended Dietary Allowances (RDA): average daily level of intake sufficient to meet the nutrient requirements of nearly all (97%-98%), healthy people.**
2. **Adequate Intakes (AI): established when evidence is insufficient to develop an RDA and is set at a level assumed to ensure nutritional adequacy.**
3. **Tolerable Upper Intake Levels (UL): maximum daily intake unlikely to cause adverse health effects.**
4. **Estimated Average Requirements (EARs): expected to satisfy the needs of 50% of the people in that age grou based on a review of the scientific literature.**

Lesson 4 - Nutritional Assessment

Nutritional assessment is the systematic process of collecting and interpreting information in order to make decisions about the nature and cause of nutrition-related health issues that affect an individual.

Malnutrition

undernutrition

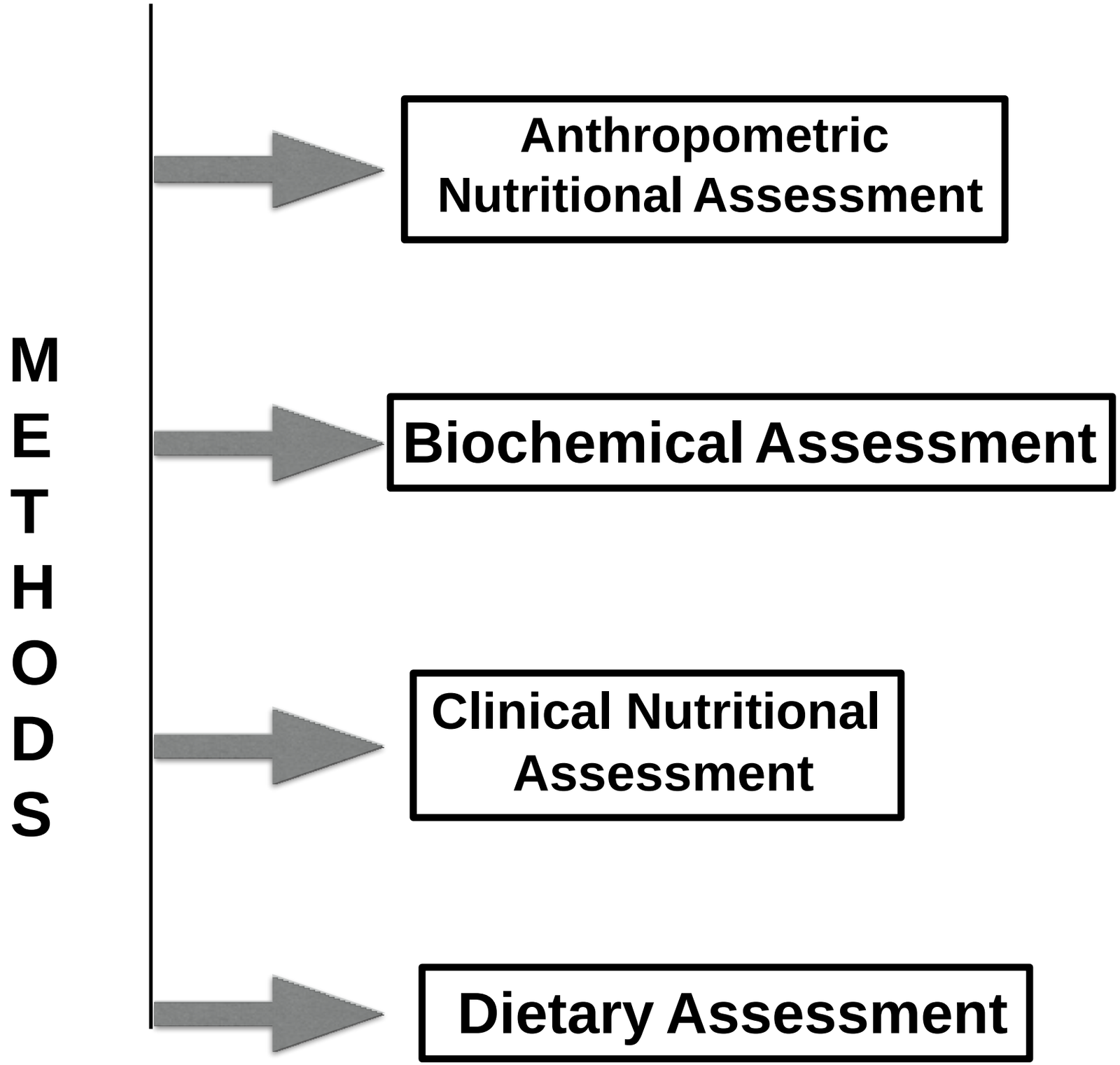
overnutrition

Importance of Nutritional Assessment

You are what you eat. Committing to nutritional assessment helps you know what you should and should not be eating if you want to live a healthy life. Let's look at some other reasons why you should prioritize nutritional assessment.

- **Nutritional assessment helps people understand their own dietary intake and how it compares with the recommended daily allowances for nutrients.**
- **Regular nutritional assessment allows you to identify any potential risks associated with poor nutrition.**
- **It helps people make informed decisions about changes to their diets.**
- **A nutritional assessment provides information about whether or not there are specific foods that you shouldn't eat.**
- **It helps you learn how to plan meals and snacks ahead so you don't have to rely on fast food or convenience options.**
- **Regular nutritional assessment is the only way to ensure you're getting enough nutrients from your meals and in the right quantities.**

Nutritional Assessment of Individuals



Anthropometric Nutritional Assessment

Anthropometric measurements are noninvasive quantitative measurements of the body that provide valuable assessments of the nutritional status of children and adults. Typically, it involves the measurement of the size, weight, and proportions of the body.

Common anthropometric measurements include:

- **Body Mass Index**
- **Waist Circumference**
- **Height**
- **Weight**
- **Skinfold thickness**
- **Bone Mineral Density**
- **Blood Pressure**
- **Heart Rate**
- **Body Fat Percentage**
- **Other measures of adiposity**
- **Muscle mass**
- **Lean Body Mass**
- **Fat-Free Mass**
- **Total Body Water**
- **Visceral fat**
- **Fasting Blood Glucose**
- **Lipid profile**

Biochemical Assessment

- **Biochemical assessment involves checking the level of nutrients in a person's blood, urine, or stool, usually through a lab test.**
- **These lab tests can help a trained medical practitioner discover any medical problems affecting your nutritional status or appetite. For example, a lab scientist might take your blood sample to measure the level of glucose in your body.**

Clinical Nutritional Assessment

Clinical assessment is the simplest and most practical method of ascertaining the nutritional well-being of a patient. In this case, the physician examines specific areas of the patient's body to discover any signs of deficiencies. A clinical nutritional assessment also involves asking the patient whether they have any symptoms that might suggest nutrient deficiency from the patient.

Dietary Assessment

- **Dietary assessment is the process of collecting information about what a person eats and drinks over a period of time. In other words, it is a record of the foods one eats in an attempt to calculate their potential nutrient intake.**

- **During a dietary assessment, the health practitioner analyzes the energy, nutrients, and other dietary constituents using food composition tables.**

- **The goal of dietary assessment is to identify appropriate and actionable areas of change in the patient's diet and lifestyle and to improve the overall wellbeing of the patient. For a detailed analysis, the health practitioner can deploy one or more of these methods:**

- **Diet Record**
- **24-hour recall**
- **Food Frequency Questionnaire**

So through this lesson we have understood that Nutritional assessment is important in maintaining fitness and general wellbeing. This is why it should be prioritized using all the tools and learnings before getting into diet planning.

Lesson 2

Carbohydrates

Lesson 1

Introduction to nutrients and macronutrients

MODULE 2

Lesson 3

Proteins

Fats

Lesson 4

Lesson 1

Nutrients

- The chemical compounds in food that are used by the body to function properly and maintain health.
- The substance used by an organism to survive, grow, and reproduce.
- The substance that provides nourishment essential for the maintenance of life and growth, providing us with energy to regulate chemical processes.

. They are basically of 7 types :-

1. Carbohydrates
2. Proteins
3. Fats
4. Vitamins
5. Minerals
6. Dietary Fibre (roughage)
7. Water

The nutrients present in food fall into two categories :-

Macronutrients :-

Macronutrients are the nutrients your body needs in larger amounts, namely carbohydrates, protein, and fat. These provide your body with energy, or calories.

Micronutrients :-

Micronutrients are the nutrients your body needs in smaller amounts, which are commonly referred to as vitamins and minerals.

Macronutrients

“Macronutrients are **the nutritive components of food that the body needs for energy and to maintain the body's structure and systems**”

They are :-

1. **Carbohydrates**
2. **Proteins**
3. **Fats**

Macronutrients also contain energy in the form of calories. Carbs are the main energy source, but your body can use other macronutrients for energy if needed

The calorie content of each macronutrient is :

Carbs: 4 calories per gram
Protein: 4 calories per gram
Fat: 9 calories per gram

Each macronutrient is incredibly important for your body to function optimally. It's crucial that you get enough carbs, protein, and fat by eating a balanced diet comprising a variety of foods.

A Balanced diet should contain following percentage of Macronutrients :

- **Carbs: 45–65% of your daily calories**
- **Protein: 10–35% of your daily calories**
- **Fat: 20–35% of your daily calories**

Lesson 1

finished

Lesson 2

Carbohydrates

- Carbohydrates – or carbs – are the body's primary fuel. They provide energy for your muscles and the central nervous system during movement and exercise.
- They are monosaccharides, disaccharides, polysaccharides etc.
- 45-65% of calories per day should come from carbohydrates. The amount depends on an individual's health goals and medical conditions.

- It can be stored in body in unlimited amounts as body fat.
- It is stored in limited amounts as glycogen in the liver and muscles.
- 1 gm of carbohydrates gives 4 kcal (16k joules/g).

Types of Carbohydrates

Simple Carbohydrates :-

- ☑ Rapidly digested and absorbed causing a quick elevation in blood sugar.
- ☑ Simple carbohydrates are broken down quickly by the body to be used as energy.
- ☑ Simple carbohydrates are found naturally in foods such as fruits, honey, etc.
- ☑ They are also found in processed and refined sugars such as candy, table sugar, syrups, and soft drinks.

Complex Carbohydrates :-

- Complex carbohydrates are made up of sugar molecules that are strung together in long, complex chains.
- Complex carbohydrates are found in foods such as peas, beans, whole grains, and vegetables.
- Both simple and complex carbohydrates are turned to glucose (blood sugar) in the body and are used as energy.

Sources of Carbohydrates :-

- **Whole-grain products, such as brown rice, oatmeal, quinoa, cereal and whole-wheat bread and pasta.**
- **Fruits, like apples, berries and melons.**
- **Nuts and seeds, including almonds, peanuts, walnuts, pumpkin seeds and sunflower seeds.**
- **Vegetables, such as corn, lima beans, broccoli, brussels sprouts and squash.**
- **Beans and legumes, such as black beans, chickpeas, lentils.**

Also, there are two types of sugars:

- **Naturally occurring sugars, such as those found in milk and fresh fruits.**
- **Added sugars, like cane sugars, coconut sugar, corn syrup, dextrose, dextrin, fructose.**

Functions of Carbohydrates

1. Carbohydrates provide the energy by their oxidation and are the primary source of energy for our body.

2. Carbohydrates, when stored in the form of glycogen, act as a short-term energy reserve.

3. They are part of the structural components, for eg, cellulose in plant cell walls, chitin in insect exoskeleton, pentose sugars (ribose island deoxyribose in DNA and RNA).

4. Have a protein sparing action.

5. Present in glycoproteins and glycolipids that are parts of cell membranes and receptors.

Lesson 2

finished

Lesson 3

Proteins

●Proteins are known as the building blocks of our body. They form the major solid matter of our muscles, organs, glands, bones, teeth, skin, nails, hair.

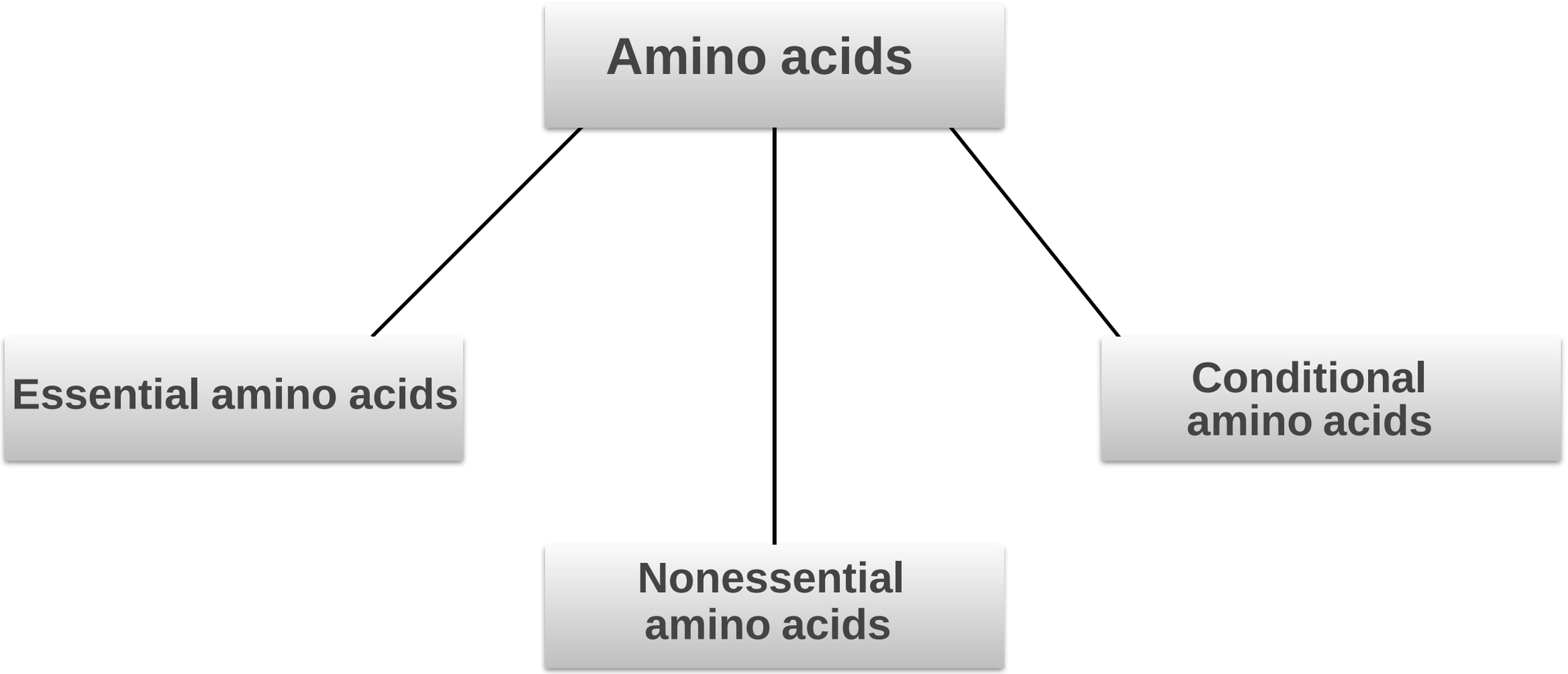
●Even the blood contains proteins in the form of haemoglobin, enzymes, neurotransmitters, and hormones.

- Amino acids and proteins are the building blocks of life.

- Proteins consist of one or more chains of amino acids called polypeptides.

●When proteins are digested or broken down, amino acids are left. The human body uses amino acids to make proteins to help the body break down food, grow, repair body tissue, perform many other body functions.

- 1 gm protein gives 4 kcal of energy.



Classification of Amino acids

ESSENTIAL AMINO ACIDS

●Essential amino acids cannot be made by the body. As a result, they must come from food.

●The 9 essential amino acids are: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.

NON-ESSENTIAL AMINO ACIDS

- Nonessential means that our bodies can produce the amino acid, even if we do not get it from the food we eat.
- Nonessential amino acids include: alanine, arginine, asparagine, aspartic acid, cysteine, glutamic acid, glutamine, glycine, proline, serine, and tyrosine.

CONDITIONAL AMINO ACIDS

- **Conditional amino acids are usually not essential, except in times of illness and stress.**

- **Conditional amino acids include: arginine, cysteine, glutamine, tyrosine, glycine, ornithine, proline, and serine.**

The nutritional value of a protein is measured by the quantity of essential amino acids it contains.

Different foods contain different amounts of essential amino acids. Generally:

- **Animal products** (such as chicken, egg, beef or fish and dairy products) have all of the essential amino acids and are known as 'complete' protein (or ideal or high-quality protein).

- **Plant proteins** (beans, lentils, nuts and whole grains) usually lack at least one of the essential amino acids and are considered 'incomplete' proteins.

The recommended dietary allowance of protein for an average Indian adult is 0.8 to 1 gm per kg body weight, however, the average intake is about 0.6 gm per kg body weight.

9 important functions of protein in your body.

1. **Growth and Maintenance - Repair, Your body's protein needs are dependent upon your health and activity level.**

2. **Causes Biochemical Reactions (Enzymes) like Digestion, Energy production, Blood clotting, Muscle contraction**

3. **Acts as a Messenger - Hormones (Insulin, Glucagon, etc)**

4. **Provides Structure - Keratin, Collagen, Elastin**

5. **Maintains Proper pH - Hemoglobin binds small amounts of acid, helping to maintain the normal pH value of your blood.**

6. **Balances Fluids - Albumin and globulin are proteins in your blood that help maintain your body's fluid balance by attracting and retaining water.**

7. **Bolsters Immune Health - Proteins help form immunoglobulins, or antibodies, to fight infection.**

8. **Transports and Stores Nutrients - Hemoglobin is a protein that carries oxygen from your lungs to body tissues.**

9. **Provides Energy - Protein contains four calories per gram, the same amount of energy that carbs provide.**

Protein deficiency

Protein deficiency is when your intake is unable to meet your body's requirements. The most severe form of protein deficiency is known as kwashiorkor.

Too little protein may cause changes in body composition that develop over a long period of time, such as muscle wasting.

1. **Edema - Low amounts of human serum albumin, which is the most abundant protein in the liquid part of blood, or blood plasma**

2. **Skin, hair and nail problems - Flaky or splitting skin, redness and patches of depigmented skin, brittle hair**

3. **Loss of Muscle Mass - When dietary protein is in short supply, the body tends to take protein from skeletal muscles to preserve more important tissues and body functions. As a result, lack of protein leads to muscle wasting over time.**

5. **Greater risk of bone fractures** - Insufficient protein intake has been linked to a lower bone mineral density and an increased risk of fractures.

6.**Stunted growth in children** - There is a **strong association between low protein intake and impaired growth. Stunting is the most common sign of childhood malnutrition.**

7.**Increased severity and infections - Impaired immune function may increase the risk or severity of infections, a common symptom of severe protein deficiency**

8.**Increased calorie intake and uncontrolled appetite - Proteins are far more satiating than carbs and fats and provides the same amount of calories as carbs, hence an increased protein intake can help reduce overall calorie intake and help in weight loss.**

Lesson 3

finished

Lesson 4

Fats

Dietary fats, together with carbohydrates and proteins, are the main source of energy in the diet, and have a number of other important biological functions.

Sources :-

In plants, they are found in seeds (e.g. rapeseed, cottonseed, sunflower, peanut, corn and soybean), fruits (e.g. olive, palm fruit and avocado) and nuts (e.g. walnuts and almonds).

Common animal fat sources are meat, (oily) fish (e.g. salmon, mackerel), eggs and butter, ghee.

Fatty Acids and their classification :-

Fatty acids have a backbone made of carbon atoms.

★ **Short-chain fatty acids (SCFA) are fatty acids with up to 5 carbon atoms, medium-chain fatty acids (MCFA) have 6 to 12, long-chain fatty acids (LCFA) 13 to 21, and very long chain fatty acids (VLCFA) are fatty acids with more than 22 carbon atoms.**

★ **Fatty acids are also classified according to the presence and number of double bonds in their carbon chain. *Saturated* fatty acids (SFA) contain no double bonds, *monounsaturated* fatty acids (MUFA) contain one, and *polyunsaturated* fatty acids (PUFA) contain more than one double bond.**

★ **Unsaturated fatty acids can also be classified as "*cis*" (bent form) or "*trans*" (straight form), depending on whether hydrogen is bound on the same, or on the opposite side of the molecule.**

Essential Fatty Acids :-

The term essential fatty acids (EFA) refers to those polyunsaturated fatty acids (PUFA) that must be provided by foods because these cannot be synthesized in the body yet are necessary for health. There are two families of EFA, omega-3 (ω-3) and omega-6 (ω-6).

- **Omega-9 falls under MUFA and is produced by the body. Not strictly essential. Found in olive oil, walnut oil, cashew nut oil.**
- **Omega-3 and Omega-6 fall under PUFA.**
- **Omega-6 are found to go under lipid peroxidation and hence, not healthy.**

Functions of Fats :-

1. **Dietary fats, together with carbohydrates and proteins, are the main source of energy in the diet, and have a number of other important biological functions.**

2. **Besides being structural components of cells and membranes in our bodies (e.g. our brain consists mainly of fats), they are carriers of fat-soluble vitamins from our diet.**

3. **Fat metabolites are involved in processes such as neural development and inflammatory reactions.**

4. **When stored, body fat provides energy when the body requires, it cushions and protects vital organs, and helps to insulate the body.**

5. **The lipid cholesterol, found in products like cheese, eggs, meat, and shellfish, is essential for the fluidity and permeability of the membranes of body cells. It is also the precursor of vitamin D, some hormones, and bile salts, which enhance the absorption of fats in the intestine.**

Module 2
finished

Lesson 2

Vitamins and Fat soluble Vitamins

Lesson 1

Micronutrients

MODULE 3

Lesson 3

Water Soluble Vitamins

Minerals

Lesson 4

Lesson 1

Micronutrients

☑ Micronutrients are the nutrients your body needs in smaller amounts, which are commonly referred to as vitamins and minerals.

☑ However, their impact on a body's health are critical, and deficiency in any of them can cause severe and even life-threatening conditions.

Classification of Micronutrients

- Vitamins
  - Fat soluble Vitamins
  - Water soluble Vitamins
- Minerals
  - Macrominerals
  - Microminerals

Vitamins

- Vitamins are organic substances present in minute amounts in natural foodstuffs. Having too little of any particular vitamin may increase the risk of developing certain health issues.

- A vitamin is an organic compound, which means that it contains carbon. It is also an essential nutrient that the body may need to get from food.

- Different vitamins play different roles in the body, and a person requires a different amount of each vitamin to stay healthy.

Vitamins are of two types

1. Fat soluble Vitamins
2. Water soluble vitamins

Fat Soluble Vitamins

- ☑ Vitamins A, D, E, and K are fat-soluble. The body stores fat-soluble vitamins in fatty tissue and the liver, and reserves of these vitamins can stay in the body for days and sometimes months.

- ☑ Dietary fats help the body absorb fat-soluble vitamins through the intestinal tract.

Water Soluble Vitamins

- ☑ Water-soluble vitamins do not stay in the body for long and cannot be stored. They leave the body via the urine. Because of this, people need a more regular supply of water-soluble vitamins than fat-soluble ones.

- ☑ Vitamin C and all the B vitamins are water-soluble.

Vitamin A

- Vitamin A is a fat-soluble vitamin that is naturally present in many foods. Vitamin A is important for normal vision, the immune system, and reproduction.
- Vitamin A also helps the heart, lungs, kidneys, and other organs work properly.

Functions :

1. Lubricating eyes and helping improve vision
2. Makes skin soft and smooth
3. Helps the mucosal lining to grow hair for defense from Microorganisms.
4. Helps Immune system to become strong and in making antibodies.
5. Also, protecting against
    - Kidney stones
    - Autoimmune diseases
    - Asthma and allergies
6. Helps make hormones like testosterone and estrogen.

Vitamin A: 2 principal forms

Preformed vitamin A (Retinol)

- Only in Animal Sources
  - Fatty fish liver oils
  - Meat (lambs liver)
  - Dairy produce
  - Breast milk

Pro-vitamin A (β-Carotene)

- Red & orange fruits & vegetables
  - Mango/papaya
  - Red palm oil
  - Carrot
- Dark green leafy vegetables, eg. spinach

Sources :

Good sources of vitamin A (retinol) include:

- **cheese**
- **eggs**
- **oily fish**
- **milk and yoghurt**
- **liver and liver products - this is a particularly rich source of vitamin A, so you may be at risk of having too much vitamin A if you have it more than once a week (if you're pregnant you should avoid eating liver or liver products)**

You can also get vitamin A by including good sources of beta-carotene in your diet, as the body can convert this into retinol.

The main food sources of beta-carotene are:

- **yellow, red and green (leafy) vegetables, such as spinach, carrots, sweet potatoes and red peppers**
- **yellow fruit, such as mango, papaya and apricots**

Signs and Symptoms of deficiency :-

Vitamin A deficiency can result from *inadequate intake, fat malabsorption, or liver disorders.*

Deficiency impairs immunity and hematopoiesis and causes rashes and typical ocular effects (eg, xerophthalmia, night blindness).

the formation of blood cellular components

The symptoms can be :-

- **Poor night vision**
- **Dry Eyes**

●Hyperkeratosis around hair follicles, might get mistaken for goosebumps or acne.

- **Poor immunity, recurring frequent cold and coughs.**

Risk factors for deficiency :-

●Diets containing poor sources of liver, cod liver oil, multivitamin, dairy products and eggs, and red, yellow, orange or green vegetables.

- Low fat diet (lower absorption of Vit A)

●Parasites, toxic metals like mercury and lead, iron deficiency, zinc deficiency, protein deficiency, hypothyroidism, can get in way of Vit A obtained from plants.

The best way to procure Vitamin A

- Eat 100 gms of liver once a week, or 15-20 gm every day.
- If you can tolerate eggs, eat up to 3 whole eggs a day.
- If you are tolerant to milk, consume up to three servings of full-fat A2 dairy per day.
- Eat 3 or 4 cups of red, orange, yellow and green vegetables a day.

Vitamin A toxicity :-

- **Nausea**
- **Vomiting**
- **Headache**

How to correct Vit A deficiency ?

1. **Reverse the dietary risk factors**

2. **Supplements providing 25000 IU-50000 IU per day should be taken for short-term**
   use and close monitoring of serum Vitamin A must be done to ensure that it stays in normal range.

Vitamin D

Vitamin D has 2 main forms:

- **D2 (ergocalciferol)**

●D3 (cholecalciferol): The naturally occurring form and the form used for low-dose supplementation

Vitamin D3 is synthesized in skin by exposure to direct sunlight (ultraviolet B radiation) and obtained in the diet chiefly in fish liver oils and salt water fish.

Vitamin D levels may decrease with age because skin synthesis declines. Sunscreen use and dark skin pigmentation also reduce skin synthesis of vitamin D.

Vitamin D is metabolized by the liver to 25(OH)D (calcifediol, calcidiol, 25-hydroxycholecalciferol, or 25-hydroxyvitamin D), which is then converted by the kidneys to 1,25-dihydroxyvitamin D (1,25-dihydroxycholecalciferol, calcitriol, or active vitamin D hormone).

Functions of Vitamin D :-

- ☑ **Regulates bone growth and repair**
- ☑ **Keeping teeth strong**
- ☑ **Avoids soft tissue calcification**
- ☑ **Pairs with Vitamin A to boat immunity**
- ☑ **Protects against psoriasis.**
- ☑ **Helps boost testosterone in man, and decrease male hormones in women when they are too high.**

Vitamin D deficiency may result from the following :-

- Inadequate exposure to sunlight
- Inadequate intake of vitamin D
- Reduced absorption of vitamin D
- Abnormal metabolism of vitamin D
- Resistance to the effects of vitamin D

Signs and symptoms might include:

- **Fatigue.**
- **Bone pain.**
- **Muscle weakness, muscle aches, or muscle cramps.**
- **Mood changes, like depression.**

Vitamin E

- Vitamin E is a fat-soluble vitamin with several forms, like Alpha, Beta, Gamma, Delta tocopherol and Alpha, Beta , Gamma, Delta tocotrienol. Alpha-tocopherol is the only one used by the human body.

- Its main role is to act as an antioxidant, scavenging loose electrons—so-called “free radicals”—that can damage cells.

- It also enhances immune function and prevents clots from forming in heart arteries.
- Vitamin E has the ability to protect cells from free radical damage as well as reduce the production of free radicals in certain situations.

Sources :

Vitamin E is found in plant-based oils, nuts, seeds, fruits, and vegetables.

- Wheat germ oil
- Sunflower seeds
- Almonds
- Peanuts, peanut butter
- Beet greens, collard greens, spinach
- Pumpkin
- Red bell pepper
- Asparagus
- Mango
- Avocado
- Use High-PUFA foods like fatty fish, nuts and seeds. Avoid high PUFA oils like canola, soybean, corn, cottonseed, and sunflower or safflower oils. Use grass-fed animal products whenever possible.

Signs of Deficiency

People who have digestive disorders or do not absorb fat properly (e.g., pancreatitis, cystic fibrosis, celiac disease) can develop a vitamin E deficiency. The following are common signs of a deficiency:

- **Retinopathy (damage to the retina of the eyes that can impair vision)**

- **Peripheral neuropathy (damage to the peripheral nerves, usually in the hands or feet, causing weakness or pain)**

- **Ataxia (loss of control of body movements)**

- **Decreased immune function**

- **Increased damage or poor healing in the gut, skin and lungs.**

- **Increased vulnerability to thyroid disorders and infections.**

- **Increased wear and tear on the tissues.**

Its severe deficiency results in neurological problems which can involve loss of coordination, difficulty in walking, visual problems resulting from damage to the retina, and pain, weakness, numbness, or tingling in the hands and feet.

Vitamin K

Vitamin K plays a key role in helping the blood clot, preventing excessive bleeding. Unlike many other vitamin vitamin K is not typically used as a dietary supplement.

The most important forms of Vitamin K are vitamin K1 and vitamin K2.

Vitamin K1 (phylloquinone) is obtained from leafy greens and some other vegetables.

Vitamin K2 (menaquinone) (MK-4 and MK-7) is a group of compounds largely obtained from meats, cheeses, and eggs (MK-4), and synthesized by bacteria or fermented foods (MK-7).

- **MK-4 - Helps the cells to decide what to make**

- **MK-7 - Much more effective for bone health**

Functions of Vitamin K :-

1. **Helps in blood coagulation**

2. **Helps in calcium metabolism and prevents calcium from going into soft tissues (such as kidneys, blood vessels, and cartilage)**

3. **It helps you make insulin and remain very sensitive to insulin**

4. **It helps improve exercise performance by enhancing your ability to utilise energy during bouts of physical activity.**

Sources of Vitamin K :-

Fermented foods, natto made from black beans, emu oil, goose liver, beef liver, hard cheese, egg yolks, dark chicken meat.

Also, ghee from pasture-raised cows, chicken liver or heart, goose leg, butter or lard.

Signs of deficiency :-

- Defective blood clotting
- Easy bruising or blood accumulating at the surface of the skin

Things that hurt Vitamin K status :-

1. **Fat malabsorption could hurt Vit K status.**

2. **The recycling of Vitamin K requires thiamine, riboflavin, and niacin. Deficiencies of these could hurt Vitamin K status.**

Lesson 2

finished

Water Soluble Vitamins

- ☑ **Water-soluble vitamins do not stay in the body for long and cannot be stored. They leave the body via the urine. Because of this, people need a more regular supply of water-soluble vitamins than fat-soluble ones.**

- ☑ **Vitamin C and all the B vitamins are water-soluble.**

Vitamin C

Vitamin C is a vital nutrient for health. It helps form and maintain bones, skin, and blood vessels. It is also an antioxidant.

Vitamin C is water soluble, and the body does not store it. To maintain adequate levels of vitamin C, people need to consume food that contains it every day.

Functions of Vitamin C :-

- **It helps the body produce collagen, L-carnitine, and some neurotransmitters.**
- **As an antioxidant, it helps remove unwanted substances from the body.**
- **It helps the body absorb iron.**
- **It boosts the immune system.**
- **It enhances wound healing.**

Sources of Vitamin C :-

The best sources of vitamin C are fresh fruits and vegetables. However, heat and cooking in water can destroy some of the vitamin C content in these foods, so eating raw foods is best.

Some good sources of vitamin C include:

- **red and green peppers**
- **oranges and orange juice**
- **grapefruit**
- **kiwifruit**
- **strawberries**
- **spinach and other green, leafy vegetables**
- **tomatoes**
- **potatoes**
- **green peas**

Risks of deficiency

Those at risk of vitamin C deficiency include

- **people who smoke or have exposure to secondhand smoke**
- **infants who consume only evaporated or boiled milk**
- **people who do not consume a varied diet**
- **people with certain health conditions, especially those that involve intestinal malabsorption**

Vitamin C toxicity :-

Taking too much vitamin C is unlikely to cause any significant problems, but if a person consumes more than 1,000 mg of vitamin C per day, they will not absorb it all. This may lead to diarrhea and gastrointestinal discomfort.

People are unlikely to consume too much through their diet, and their bodies cannot store it. However, having a high intake through supplements may result in kidney stones.

Vitamin B

☑B vitamins are a group of eight essential nutrients that play roles in many organs and bodily systems. Although they can work together in the body, they also carry out their own unique functions.

☑B vitamins are important for making sure the body's cells are functioning properly. They help the body convert food into energy (metabolism), create new blood cells, and maintain healthy skin cells, brain cells, and other body tissues.

There are eight types of B vitamin, each with their own function:

1. **thiamin (vitamin B-1)**
2. **riboflavin (vitamin B-2)**
3. **niacin (vitamin B-3)**
4. **pantothenic acid (vitamin B-5)**
5. **vitamin B-6**
6. **biotin (vitamin B-7)**
7. **folate (vitamin B-9)**
8. **vitamin B-12**

Together, they are called the vitamin B complex.

Thiamine (B1) :

Main functions are ;

1. **Major role in burning carbohydrates and deriving energy.**

2. **Its deficiency can make one glucose intolerant.**

3. **Helps protect us from oxidative stress.**

4. **Helps us recycle other vitamins, like Vitamin K and Folate.**

5. **We need it for detoxification.**

6. **We use this to synthesize a lot of different things like fats, cholesterol, and the building blocks of our DNA**

Signs and symptoms of Thiamine deficiency :-

- **Tingling, weakness, numbness, weakness and pain in hands and feet.**
- **Causes muscles around your eyes to become weak, paralyzed, or disordered.**
- **Hard to control your own body movements.**
- **Makes you feel confused.**
- **Weakness**

RDA for Thiamine :-

According to RDA (2020), 1.2 mg/d for adult sedentary men, and 1.1 mg/d for adult sedentary women is allowed

Thiamine food sources :-

Thiamin is present in:

- **whole grains and fortified bread, cereal, pasta, and rice**
- **pork**
- **legumes, such as black beans and soybeans**
- **seeds**
- **nuts**

You can cover Thiamin intake by

3 servings of :-

- **2 heaping teaspoons of nutritional yeast**
- **85-100 gms of legumes (lentils, peas, beans) measured before cooking**
- **85-100 gms of whole grains, measured before cooking**

Symptoms of thiamin deficiency

A person with a thiamin deficiency may experience:

- **weight loss**
- **little or no appetite**
- **memory problems or confusion**
- **heart problems**
- **tingling and numbness in the hands and feet**
- **loss of muscle mass**
- **poor reflexes**

Riboflavin (B2) :

Main functions are ;

1. It is a fat burner
2. Helps us absorb and utilise iron, which helps in preventing anaemia.
3. Prevents from oxidative stress
4. Prevents from pre-eclampsia
5. It lowers homocysteine
6. Supports a process known as Methylation
7. Helps keep blood pressure under control
8. In people suffering from migraines, high doses of riboflavin reduces the intensity.

Signs and symptoms of Riboflavin Deficiency :-

- The outer edges of lips can get red and crusty
- The corners of your mouth crack
- Tongue and all throughout the inside of your mouth gets red, bloody, and swollen.
- The skin gets red, scaly, itchy, greasy, and painful.
- Your hands and feet can get unusually sensitive to touch, heat or pain.

RDA for Riboflavin

1.6 mg/d for adult sedentary men and 1.6 mg/d for adult sedentary women.

High fat diets increase the requirement by 20-40 % depending on how much fat you eat.

Exposure to sunlight increases your needs as ultraviolet rays can damage riboflavin because it is a heat and light sensitive comp

Riboflavin sources :-

- **80-100 gm of chicken and pasture raised lamb liver**
- **Kidney and heart, almonds (150-200 gm)**
- **Red meat, cheese, eggs, salmon, mushrooms, seaweed, sesame, wheat germ and bran.**
- **organ meats**
- **fortified breakfast cereals**
- **oatmeal**
- **yogurt and milk**
- **mushrooms**
- **almonds**

Niacin (B3) :

Niacin - the most foundational and universal B Vitamin in all of the energy metabolism.

1. **Helps use neurotransmitters**

2. **Repairs DNA whenever it gets damaged.**

3. **Lengthens telomeres - a cap like structure at the end of the chromosome.**

4. **Helpful for brain, gut and skin.**

Signs and symptoms of Niacin deficiency :

Severe Niacin deficiency is known as Pellagra - 3Ds (Dementia, Dermatitis, and Diarrhoea)

Other deficiency symptoms :

- **Skin and gut issues**
- **Depression**
- **Accelerated ageing**
- **Fatigue and exercise intolerance**
- **Inflamed oesophagus**

RDA for Niacin

12 mg/d for adult sedentary men and 9 mg/d for adult sedentary women (2020)

Niacin food sources

- **Niacin requires iron, riboflavin and Vitamin B6 for its formation from proteins.**
- **Animal foods, yeast, and pulses (lentils, peas, beans)**
- **80-100 gms of Tuna, Liver (beef, pork, lamb) and unfortified nutritional yeast.**
- **Roasting, sprouting and fermentation improve niacin availability.**

Pantothenic Acid (B5)

The MYSTERY Vitamin

When we break down food for energy, we break food molecules into pieces and extract energy that had been used to hold the molecules together.
Pantothenic acid is what helps break apart the pieces. B1, B2, B3 extract this energy.
Also, it helps in other ways also :-

- **Serotonin gets converted into melatonin**
- **Helps in Haemoglobin formation**
- **Ammonia gets cleaned up**
- **Helps make mucus for eyes, ears, nose, mouth, genitals and internal organs.**

RDA for B5

- **5 mg/d for most adults,**
- **6 mg/d for pregnant women,**
- **7 mg/d for lactating women.**

. **A lot of B5 gets destroyed on heating, processing, and storage.**

Pantothenic acid food sources

- **Unfortified nutritional yeast**
- **200 gm of chicken, beef, lamb**
- **Beef pancreas or kidney**
- **Pork liver,**
- **Shiitake**

Signs and symptoms of deficiency :

- **Headache.**
- **Fatigue.**
- **Irritability, restlessness.**
- **Disturbed sleep.**
- **Nausea, vomiting, stomach cramps.**
- **Numbness or burning sensation in hands or feet.**
- **Muscle**

Pyridoxine/Pyridoxal (B6) :

The MAGICIAN

1. **Changes proteins (amino acids) into carbs (glucose)**

2. **Changes proteins into neurotransmitters**

3. **B6 helps convert ammonia into urea, which is the non-toxic form (in normal levels)**

4. **Helps release the stored carbohydrate, so that we can use it.**

5. **Helps you make Haemoglobin, which in turn helps in carrying oxygen in the blood.**

6. **Helps to get rid of high homocysteine levels.**

7. **Helps get rid of histamines.**

Signs and symptoms of deficiency :

- More irritable, depressed, confused, anxious, insomniac
- Might get sick more often.
- Causes anaemia, because Hb can’t be made properly.
- PP homocysteine will be high.
- Blood sugar might drop, making you feel irritable, shaky, fatigued between meals
- Low B6 levels might also contribute to kidney stones.

Pyridoxine food sources :

B6 comes in 2 forms in food :

- **Animal foods have pyridoxal**

- **Plant foods have pyridoxine**

We can convert the plant form into animal form within our liver, but it requires riboflavin a healthy liver.

- **Unfortified nutritional yeast, avocado, banana, quinoa, hazelnuts, sesame seeds.**

- **250-300 gms of liver, fresh tuna, salmon, chicken, turkey**

Risk factors

- **Most plants have a lot of their B6 bound to sugars that make it hard to absorb.**

●Cooking makes B6 bind to the protein in the food. This turns it into a B6 antagonist.

RDA for B6 :-

1.6 mg/d for adult sedentary men and 1.6 mg/d for adult sedentary women (2020)

Biotin (B7) :

The MASTER BUILDER

- **Helps burn food for energy.**
- **Biotin is needed to metabolise carbohydrates, fatty acids and amino acids.**
- **Often recommended for strengthening hair, nails, etc.**
- **It is also a water soluble vitamin.**
- **Important for normal embryonic growth , hence critical during pregnancy.**

Biotin food sources :

- **Liver and egg yolks are best.**

- **Meat, fish, almonds, walnuts, avocado, peanuts and sunflower seeds.**

●For vegans, nuts and oilseeds are best choices but will have to be taken in large amounts.
Egg whites have an antinutrient named Avidin.
Cooking egg whites helps destroy this biotin-binding substance.

- **Poaching - leaves 71% of anti-biotin activity**
- **Frying - leaves 33 % of anti-biotin activity**
- **Boiling for 4 minutes - destroys most of it**
- **Boiling for 6 minutes - destroys all of it.**

RDA for Biotin

30 mcg/d for adults

- **3 whole eggs**
- **70 gm beef liver**
- **Half of 14-16 gm chicken**

Signs and symptoms of Biotin deficiency :

- **Hair loss,**
- **Dry scaly skin,**
- **Cracking in corners of mouth (cheilitis)**
- **Swollen and painful tongue (glossitis)**
- **Dry eyes**
- **Loss of appetite**
- **Fatigue**
- **Insomnia**
- **Depression**

Folate (vitamin B-9)

The natural form of vitamin B-9 is called folate. Folic acid, which is present in fortified foods and some supplements, is a synthetic form of the vitamin.

Folate is also essential for:

- **DNA replication**
- **metabolism of vitamins**
- **metabolism of amino acids**
- **proper cell division**

Sources

- dark green leafy vegetables
- beef liver
- avocado
- papaya
- orange juice
- eggs
- beans
- nuts

Symptoms of folate deficiency

- **weakness**
- **headache**
- **heart palpitations**
- **irritability**
- **sores on the tongue or in the mouth**
- **skin, hair, or nail changes**

RDA for Folate

Vitamin B-12

Vitamin B-12 contains the mineral cobalt and is sometimes called a “cobalamin.”

Functions of vitamin B-12:

- **creating new red blood cells**
- **DNA synthesis**
- **brain and neurological function**
- **fat and protein metabolism**

Sources

Vitamin B-12 occurs naturally in animal products such as:

- **clams**
- **beef liver**
- **salmon**
- **beef**
- **milk and yogurt**

People who do not eat animal products may need to get vitamin B-12 from supplements or fortified foods such as breakfast cereals and nutritional yeast.

Symptoms of vitamin B-12 deficiency

Vitamin B-12 deficiency usually causes a condition called megaloblastic anemia. Symptoms of a vitamin B-12 deficiency can include:

- **fatigue**
- **weight loss**
- **constipation**
- **loss of appetite**
- **numbness and tingling in the hands and feet**
- **memory problems**
- **depression**

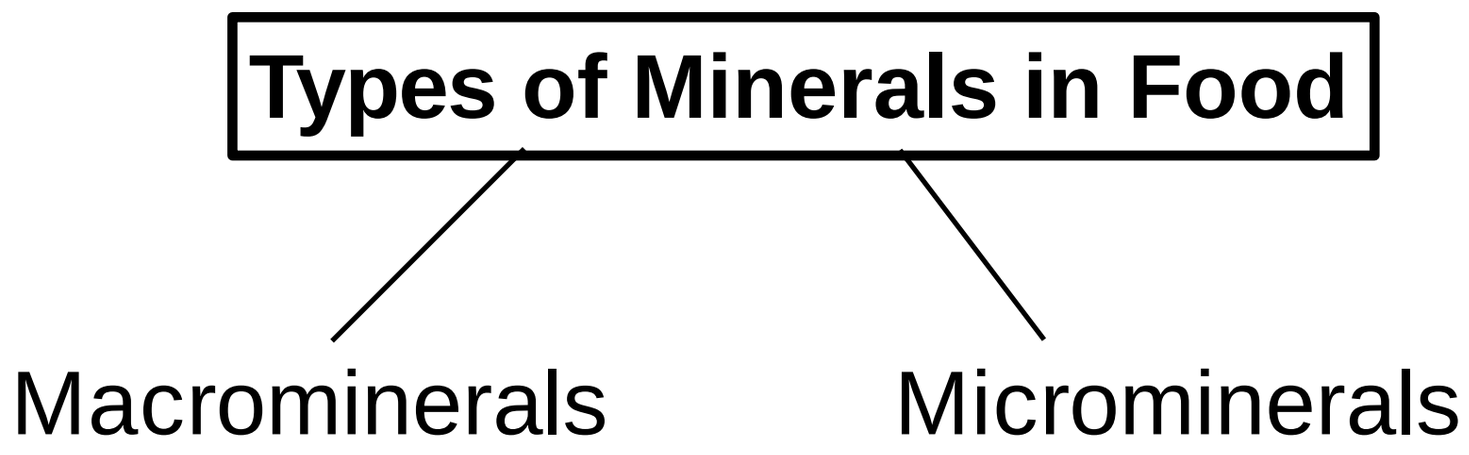
Lesson 4

MINERALS

- **Minerals in food are the elements present in food that are required by our body to develop and function properly.”**

- **Minerals are inorganic substances required by the human body to function correctly. The human body requires varying amounts of minerals daily in order to build strong bones and muscles.**

- **It also helps to maintain various bodily functions. Therefore, we obtain these nutrients from eating foods rich in minerals.**



Macrominerals

- Macrominerals are those minerals which are required in relatively large doses. Therefore, they are also called major minerals.

- Macrominerals include sodium, calcium, chloride, magnesium, potassium, phosphorus, and sulfur. These minerals are vital for the proper functioning and metabolism of the body. Our body cannot produce these minerals; hence, they need to be obtained from a food source.

- The deficiency of these minerals results in severe ramifications for health. For example, calcium deficiency weakens the skeletal system, thereby increasing the risk of fractures. The deficiency of Iodine results in goitre and other hormonal disorders, and the deficiency of sodium results in hyponatremia.

Microminerals

- **Also called trace minerals, these are minerals which are required in small amounts. Therefore, they are also called minor minerals.**

- **Trace minerals include iron, copper, iodine, zinc, manganese, fluoride, cobalt and selenium.**

- **If these trace minerals are taken in excessive quantities, mineral toxicity is induced. For instance, acute selenium toxicity is observed if an individual overdoses on dietary supplements. It can cause nausea, nail discolouration or brittleness, hair loss, and diarrhoea.**

CALCIUM

- **Among minerals, calcium (Ca) is the most abundantly present in humans, representing 52% of the body's mineral content and amounting to 1.2% of body weight.**

- **Nearly all (99%) of total body calcium is located in the skeleton. The remaining 1 % is equally distributed between the teeth and soft tissues, with only 0.1% in the extracellular fluid (ECF).**

- **This mineral helps build strong bones, so you can do everything from standing up straight to scoring that winning goal. It also helps build strong, healthy teeth, for chomping on tasty food.**

Sources

- **Dairy products**
- **Ragi**
- **Amaranth seeds**
- **Green Leafy Vegetables**
- **legumes and grains**
- **nuts and seeds, especially almonds, sesame, and chia**
- **tofu**

Functions

- **Bone health Calcium is essential for the development, growth, and maintenance of bone**
- **Muscle contraction Calcium helps regulate muscle contraction. When a nerve stimulates a muscle, the body releases calcium. The calcium helps the proteins in muscle carry out the work of contraction.**
- **Cardiovascular system Calcium plays a key role in blood clotting. The process of clotting is complex and has a number of steps. These involve a range of chemicals, including calcium.**

- **Calcium is a co-factor for many enzymes. Without calcium, some key enzymes cannot work efficiently.**

Calcium deficiency Symptoms

- **Extreme fatigue**
- **dry skin or dry, broken, or brittle nails**
- **Osteopenia and osteoporosis**
- **Dental problems like tooth decay, brittle teeth,irritated gums**
- **Depression Some evidenceTrusted Source suggests that calcium deficiency may be linked with mood disorders, including depression, though confirming this will require further research.**
- **Severe PMS Low calcium levels have been linked to severe premenstrual syndrome (PMS).**
- **Muscle problems like muscle aches, cramps, and spasms pain in the thighs and arms when walking or moving**

MAGNESIUM

- Magnesium (Mg) ranks fourth in overall abundance in body among the cations. It is also the least abundant among macro minerals, the total amount in the body being 25g.

- Like Ca and P, this mineral is also present in the bones but unlike them which constitute 99% and 85% of the bones, respectively only 55-60% of total magnesium is located in the skeleton. Another 20-25% is found in muscles with remaining in other soft tissues. Only 1% of total body magnesium is extracellular.

- Magnesium is an important mineral, playing a role in over 300 enzyme reactions in the human body. Its many functions include helping with muscle and nerve function, regulating blood pressure, and supporting the immune system.

Sources

- Avocados
- Nuts
- Legumes
- Tofu
- Seeds
- Whole Grains
- Fatty Fish
- Bananas
- Leafy Greens

Functions

Bone health

While most research has focused on the role of calcium in bone health, magnesium is also essential for healthy bone formation.Magnesium may improve bone health both directly and indirectly, as it helps to regulate calcium and vitamin D levels, which are two other nutrients vital for bone health.

Diabetes

Research has linked high magnesium diets with a lower risk of type 2 diabetes. This may be because magnesium plays an important roleTrusted Source in glucose control and insulin metabolism.

Cardiovascular health

The body needs magnesium to maintain the health of muscles, including the heart. Research has found that magnesium plays an important role in heart health.

Migraine headaches

Magnesium therapy may helpTrusted Source prevent or relieve headaches. This is because a magnesium deficiency can affect neurotransmitters and restrict blood vessel constriction, which are factors doctors link to migraine.

Anxiety

Magnesium levels may play a role in mood disorders, including depression and anxiety.

Symptoms of magnesium deficiency

- a loss of appetite
- nausea or vomiting
- fatigue or weakness
- muscle cramps
- numbness
- tingling
- seizures
- personality changes
- heart rhythm changes or spasms

Phosphorus

- **Our DNA is almost 30% Phosphorus**
- **Most of our B Vitamins involved in energy metabolism get activated using phosphorus.**
- **If in excess, it can make our bones weak.**

Sources

- **Chicken and Turkey**
- **Pork**
- **Organ Meats**
- **Dairy Low-fat dairy products like milk, cottage cheese and yogurt**
- **Sunflower and Pumpkin Seeds**
- **Nuts Many nuts, and especially Brazil nuts, are good sources of phosphorus.**
- **Whole Grains Whole grains like wheat, oats and rice contain a lot of phosphorus. Soaking, sprouting or fermenting the grains may make it more available for absorption.**
- **Amaranth and Quinoa**
- **Beans and Lentils**

functions of phosphorus

forms and keeps strong bones and teeth

helps maintain our energy levels

forms our genetic material (DNA & RNA)

helps form the membranes of our cells

keeps the healthy function of our brain & nervous system

helps to maintain normal acid-balance (pH)

helps oxygen delivery in the body

Symptoms of Phosphorous deficiency

Phosphorus deficiency is not a risk for the general population, since most people can get the recommended amounts of phosphorus from a varied and balanced diet.Few symptoms are listed below

- **fatigue**
- **joint pain**
- **bone pain**
- **breathing problems**
- **electrolyte imbalances**
- **confusion**
- **irritability**

Sodium

Sodium is one of the major minerals, which our bodies need in relatively larger amounts to keep healthy. We can find sodium naturally in a variety of foods, but it's often common that we have it as sodium chloride, also known as table salt.

Sources

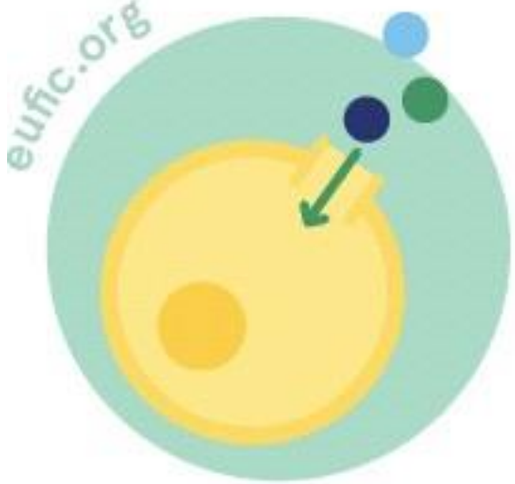
- **Sodium is naturally found in all unprocessed foods, although in very small amounts. For example, raw meat and fish can contain between 30 to 150 mg per 100 g of food, while fruits and vegetables usually have less than 50 mg per 100 g of food.**

- **Yet it's the sodium added to foods as table salt or through food additives (during cooking or food processing), that most contributes to our daily intake of this mineral, often in excessive amounts.**

- **Some examples of foods high in sodium are shown in the image below and include:**

  - **food sauces (such as soy sauce)**
  - **processed meats (such as ham, bacon, sausages, etc.)**
  - **cheese**
  - **canned fish.**

functions of sodium



helps our cells
uptake nutrients
& water

helps our muscles
contract

helps our nerves
carry messages between
the brain & the body

balances our bodies'
fluids & regulates
blood pressure

Symptoms of Sodium deficiency

It’s not common to have too little sodium in our diets since this mineral is present in most foods.

Sodium deficiency is mainly associated with metabolic disorders or specific health conditions (such as severe episodes of diarrhoea or kidney malfunction) that cause our bodies to remove excessive amounts of this mineral.

Mild hyponatremia may not cause symptoms, but when they occur, they can include:

- **confusion**
- **sluggishness**
- **a headache**
- **fatigue and low energy**
- **nausea**
- **restlessness**
- **irritability**

Hyponatremia occurs when the concentration of sodium in your blood is abnormally low.

Potassium

☑Potassium is a vital mineral and electrolyte that your body needs to maintain normal blood pressure, transport nutrients into your cells, and support healthy nerve and muscle function.

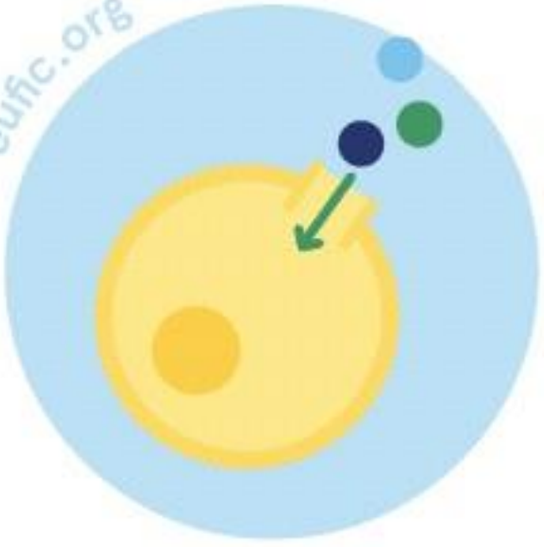
☑It’s considered an essential nutrient because your body can’t produce it. Therefore, you must get potassium from foods to meet your recommended daily needs/

Sources

We can find potassium in almost every food, but some of its richest sources include:

- starchy roots or tubers
- Spinach
- Watermelon
- Coconut water
- whole grains
- Legumes Legumes such as lentils, chickpeas, soybeans, and peanuts are rich in potassium. Soaking or sprouting them before eating them may improve mineral absorption.
- Beets
- dairy products
- Pomegranate
- fish

functions of potassium



helps our cells uptake nutrients & water

helps our muscles contract

helps our nerves carry messages between the brain & the body

balances our bodies' fluids & regulates blood pressure

helps our bodies digest foods

Symptoms of potassium deficiency

Low levels of potassium in the blood are called hypokalaemia and are mainly caused by specific health conditions in which our bodies lose too much potassium.

Some of the possible symptoms of potassium deficiency are

- **Constipation**
- **Muscle weakness**
- **Unexplained fatigue**
- **High blood pressure**
- **Irregular heart rhythms Potassium plays an important role in regulating the contractions of all muscles, including the heart muscle.**

Chloride

☑ **Chloride is one of the major minerals, which our bodies need in relatively larger amounts to keep healthy.**

☑ **We can find chloride naturally in a variety of foods, but it's often common that we have it as sodium chloride, also known as table salt.**

☑ **Chloride is involved in many of our bodily functions. Similar to sodium and potassium, chloride creates specific channels in the membranes of our cells which help to carry different vital tasks.**

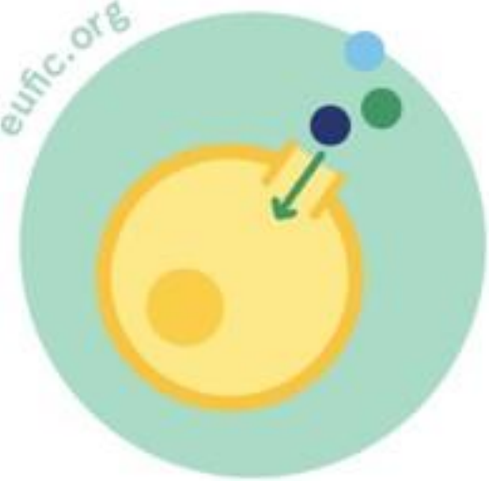
Sources

- **Chloride is found in table salt or sea salt as sodium chloride.**

- **It is also found in many vegetables. Foods with higher amounts of chloride include seaweed, rye, tomatoes, lettuce, celery, and olives.**

- **Chloride, combined with potassium, is also found in many foods. Potassium chloride is a common salt substitute.**

functions of chloride



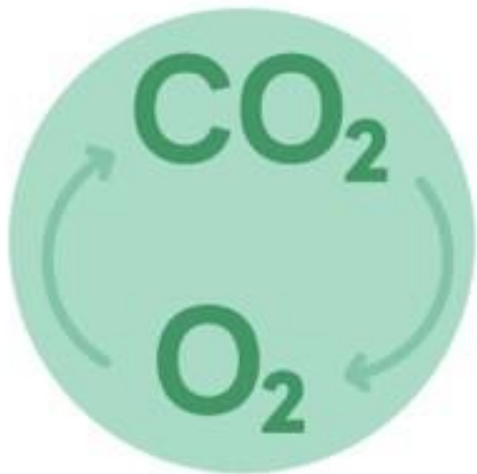
helps our cells take in and out nutrients & water

helps our muscles contract

helps our nerves carry messages between the brain & the body

balances our bodies' fluids & regulates blood pressure

helps our bodies digest foods



helps the oxygenation of our bodies

Symptoms of chloride deficiency

It’s not common to have too little chloride in our diets since this mineral is present in most foods.

Chloride deficiency is often a result of specific metabolic disorders or health conditions (such as severe episodes of diarrhoea or kidney malfunction) that cause our bodies to remove excessive amounts of this mineral.

Microminerals

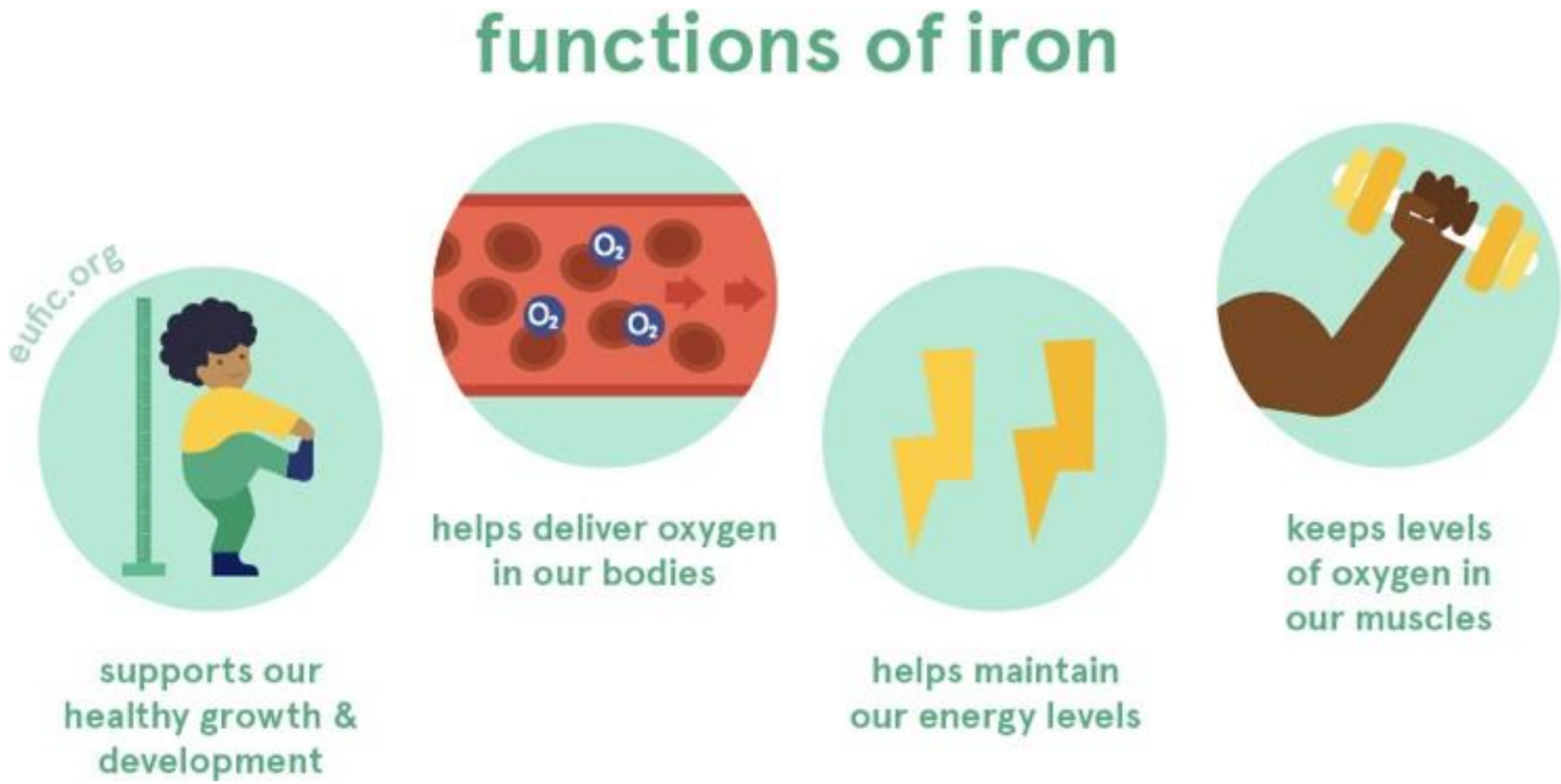
- **Also called trace minerals, these are minerals which are required in small amounts. Therefore, they are also called minor minerals.**

- **Trace minerals include iron, copper, iodine, zinc, manganese, fluoride, cobalt and selenium.**

- **If these trace minerals are taken in excessive quantities, mineral toxicity is induced. For instance, acute selenium toxicity is observed if an individual overdoses on dietary supplements. It can cause nausea, nail discolouration or brittleness, hair loss, and diarrhoea.**

Iron

Iron is a mineral vital to the proper function of hemoglobin, a protein needed to transport oxygen in the blood. Iron also has a role in a variety of other important processes in the body.



Sources

foods rich iron include:

- **meat**
- **fish**
- **cereals and beans**
- **nuts**
- **egg yolks**
- **dark green vegetables and potatoes**
- **fortified food products.**

Symptoms of Iron deficiency

- Anemia
- Extreme fatigue.
- Weakness.
- Pale skin.
- Chest pain, fast heartbeat or shortness of breath.
- Headache, dizziness or lightheadedness.
- Cold hands and feet.
- Inflammation or soreness of your tongue.
- Brittle nails.

Zinc

- Zinc is one of the trace elements, which our bodies only need in small amounts to keep healthy.
- Zinc is a mineral that your body uses for fighting off infections and producing cells.
- It’s important for healing injuries and creating DNA, the genetic blueprint in all of your cells.
- If you’re not getting enough zinc in your diet, you may have side effects such as hair loss, lack of alertness, and a reduced sense of taste and smell.

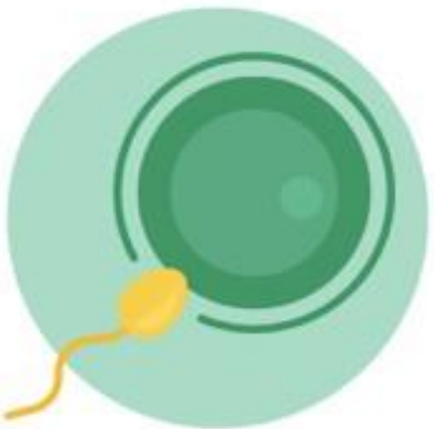
functions of zinc

supports our healthy growth & development

supports our immune system

helps our nerves carry messages between the brain & the body

helps form our genetic material (DNA) & regulates gene expression



supports our reproduction

helps our bodies build proteins

Sources

- **Meat**
- **Legumes**
- **Seeds Some seeds like hemp, pumpkin, squash and sesame seeds contain significant amounts of zinc.**
- **Nuts nuts such as pine nuts, peanuts, cashews and almonds can boost your intake of zinc.**
- **Dairy Dairy foods are good sources of zinc.**
- **Eggs Eggs contain a moderate amount of zinc and can help you meet your daily target.**
- **Whole Grains Whole grains like wheat, quinoa, rice and oats contain some zinc.**
- **Dark Chocolate Dark chocolate can be a source of zinc. However, it’s also high in calories and sugar, so it should be eaten in moderation and not as a primary source of zinc.**

Symptoms of deficiency

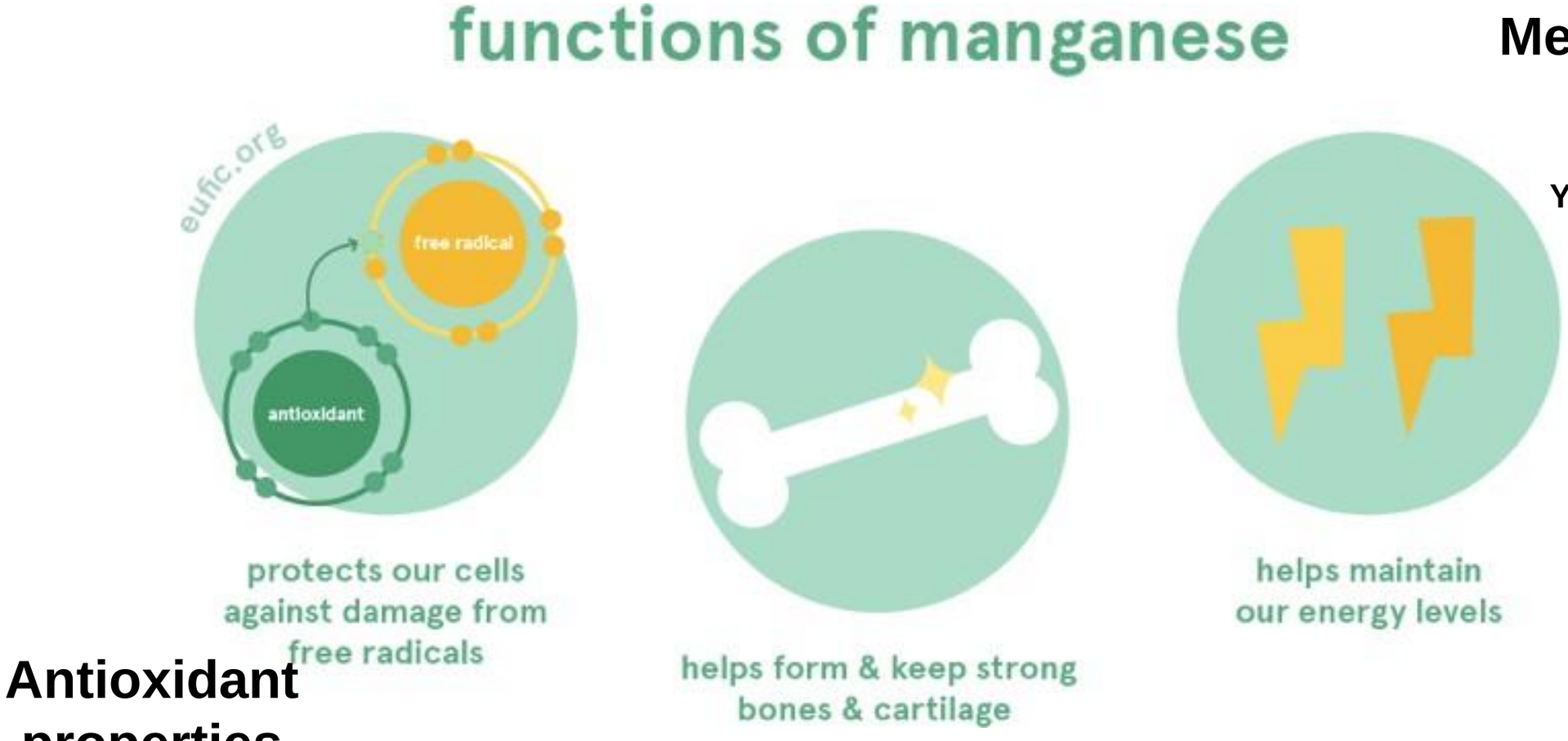
When you're zinc deficient, your body can't produce healthy, new cells. This leads to symptoms such as:

- **unexplained weight loss**
- **wounds that won't heal**
- **lack of alertness**
- **decreased sense of smell and taste**
- **diarrhea**
- **loss of appetite**
- **open sores on the skin**

Manganese

Manganese is one of the trace elements, which our bodies only need in small amounts to keep healthy. We can find manganese in a variety of foods, as well as in drinking water.

Manganese is needed by different enzymes, which are involved in many bodily functions.



Antioxidant properties

Metabolism

Your body contains numerous proteins called enzymes. Enzymes help to speed up chemical reactions.

Sources

Some of the foods richest in manganese include:

- **nuts and seeds**
- **chocolate**
- **cereal-based products**
- **seafood**
- **pulses**
- **fruits and fruit products.**

Symptoms of deficiency

Since manganese is found in many foods within our daily diets, reports of manganese deficiency are rare.

A person that does have a deficiency in manganese could experience the following symptoms:

- **poor bone growth or skeletal defects**
- **slow or impaired growth**
- **low fertility**
- **impaired glucose tolerance, a state between normal glucose maintenance and diabetes**
- **abnormal metabolism of carbohydrate and fat**

Copper

- ☑ Copper is a mineral found throughout your body. It’s a nutrient that your body needs in small amounts to function properly.

- ☑ Other heavy metals, like lead, mercury, and arsenic, aren’t good for you. But getting copper in trace amounts is essential. Getting too much or not enough of it can cause health problems.

Sources

One easy way to make sure you're getting enough copper is to eat foods that contain it. You can find copper in shellfish and organ meats, like liver.

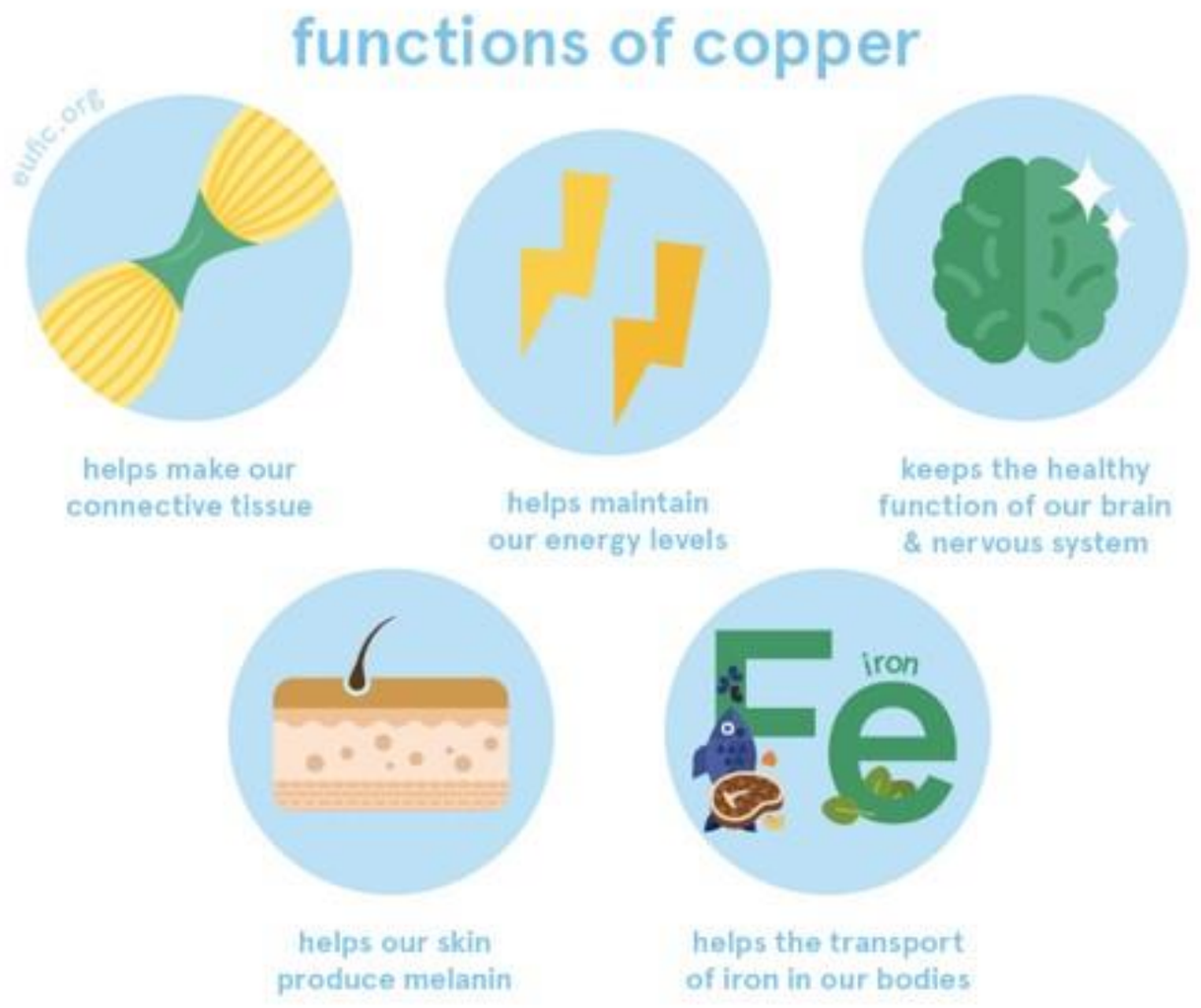
You can also get a good amount of copper by eating vegetables, grains, and seeds, like:

- **potatoes**
- **peas**
- **beans**
- **green vegetables**
- **whole grains**
- **sunflower seeds**

Peanut butter and dark chocolate also contain copper.

Copper has an important role in a number of functions, including the:

- **production of red blood cells**
- **regulation of heart rate and blood pressure**
- **absorption of iron**
- **prevention of prostatitis, or inflammation of the prostate**
- **development and maintenance of bone, connective tissue, and organs like the brain and heart**
- **activation of the immune syste**



Symptoms of deficiency

If you’re in good health, you’re not likely to have low levels of copper. Symptoms of copper deficiency may include:

- **tremors**
- **a tingling sensation**
- **an unstable gait**
- **numbness**
- **fatigue**
- **anemia**
- **a loss of vision**

Selenium

- **Selenium may be less known, but truth is that without this mineral, many essential bodily functions would be compromised.**

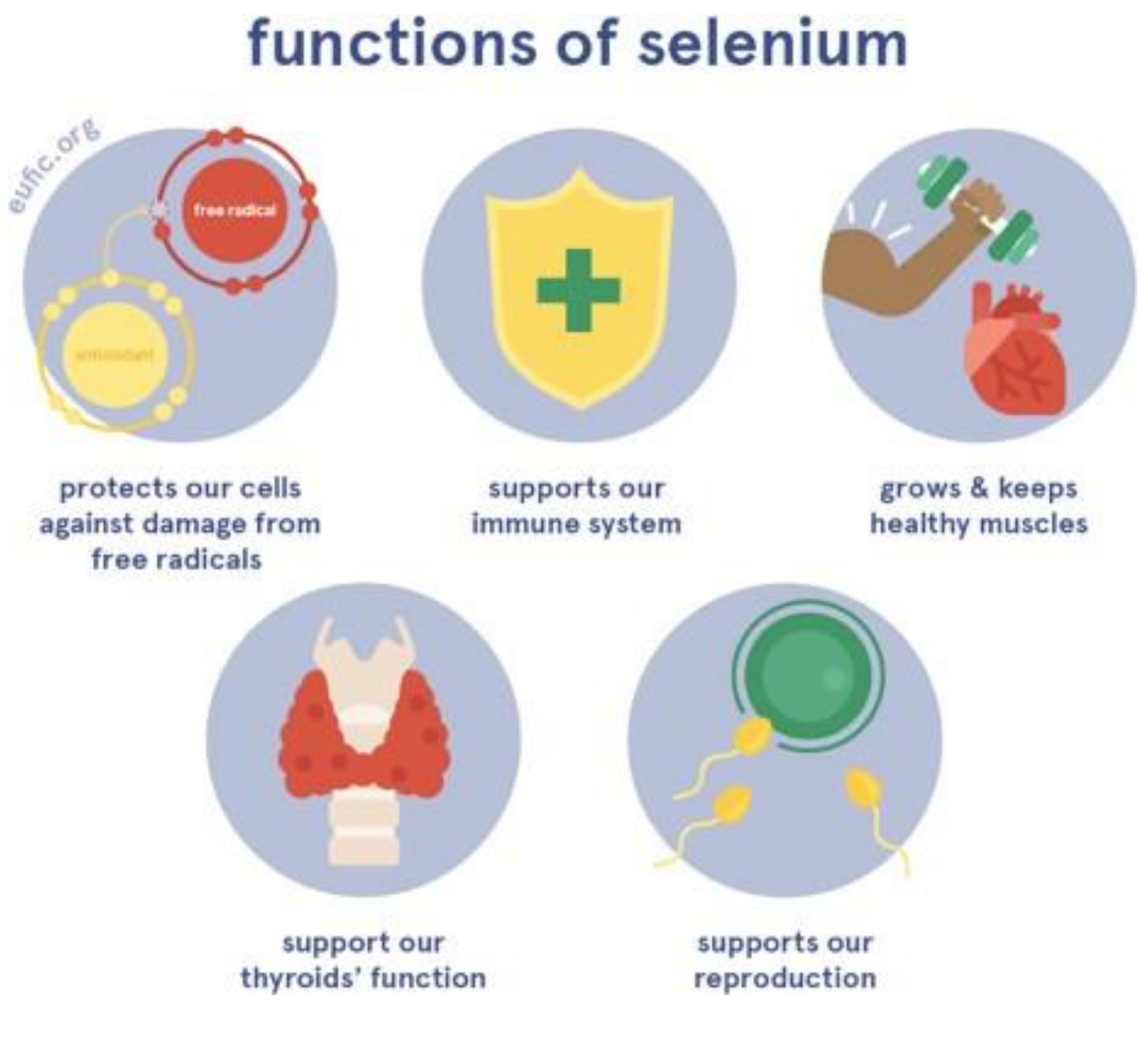
- **Selenium is one of the trace minerals, which our bodies only need in tiny amounts to keep healthy.**

- **Selenium act as an antioxidant, it may help fight off illness.**

- **Some researchTrusted Source suggests that a low selenium level might increase your risk of developing certain cancers. Many studies have been conducted to find out if there’s a link between selenium intake and breast ca risk in particular.**

Selenium is critical to good health, helping with:

- **thyroid function**
- **immune system function**
- **reproduction**
- **DNA synthesis**
- **protection from free radicals and infection**



Sources

good animal sources of selenium include:

- **seafood**
- **meat and poultry**
- **eggs**
- **dairy products.**

Usually, selenium-rich plants include:

- **brazil nuts**
- **rapeseed**
- **broccoli**
- **cabbage**
- **garlic and onions**
- **leek and wild leek.**

Symptoms of deficiency

Selenium deficiency can produce a range of symptoms. The most common ones are:

infertility in men and women
muscle weakness
fatigue
mental fog
hair loss
weakened immune system

Iodine

☑ Iodine is one of the trace elements, which our bodies need in very small amounts to keep healthy.

☑ Iodine is a type of mineral that’s naturally found in the earth’s soil and ocean waters. Many salt water and plant-based foods contain iodine, and this mineral is most-widely available in iodized salt.

☑ It’s important to get enough iodine in the diet. It regulates hormones, fetal development, and more.

functions of iodine

needed to produce the
thyroid hormones which:

support our thyroids'
function

support our healthy
growth & development

regulate our
overall metabolism

maintain our
energy levels

regulate our
body temperature

Sources

Some of the richest sources of iodine are seafood, such as fish, shellfish, molluscs and seaweed.

We can also get iodine from eggs, milk and dairy, though the amounts depend on the iodine content of the animal's diet.

Many countries add iodine to salt (iodised salt), which helps to increase the intake of this mineral. While iodised salt can be a good alternative to regular salt, we should be mindful about our salt intake in general and prioritise other sources of iodine in the diet.

Symptoms of deficiency

Iodine deficiency can only be diagnosed via urine tests.

The symptoms of low iodine levels are primarily detected through thyroid symptoms, such as:

- **a visible goiter**
- **thyroid gland that’s painful or tender to the touch**
- **breathing difficulties, especially when lying down**
- **difficulty swallowing**
- **fatigue**
- **extreme feelings of coldness, despite normal temperatures**
- **hair loss**
- **depression**
- **brain fog**
- **unintentional weight gain**

SUMMARY OF EAR FOR INDIANS – 2020

Age Group	Category of work	Body Wt (kg)	Energy (**) (Kcal/ d)	Protein (g/d)	Cal cium (mg/ d)	Magnes ium (mg /d)	Iron (mg/ d)	Zinc (mg/ d)	Iodine (µg/ day)	Thiamine (mg/ d)	Ribo flavin (mg/ d)	Niacin (mg /d)	Vit B6 (mg/ d)	Folate (µg /d)	Vit B12 (µg/ d)	Vit C (mg/ d)	Vit A (µg/ d)	Vit D (IU /d)
Men	Sedentary	65	2110	43.0	800	370	11	14.0	95	1.2	1.6	12	1.6	250	2	65	460	400
	Moderate		2710							1.5	2.1	15	2.1					
	Heavy		3470							1.9	2.7	19	2.6					
Women	Sedentary	55	1660	36.0	800	310	15	11.0	95	1.1	1.6	9	1.6	180	2	55	390	400
	Moderate		2130							1.4	2.0	12	1.6					
	Heavy		2720							1.8	2.6	15	2.1					
	Pregnant woman	55 + 10	+ 350	+7.6 (2nd trimester) +17.6 (3rd trimester)	800	370	21	12.0	180	1.6	2.3	+2	1.9	480	+0.2	+10	406	400
	Lactation 0-6m	-	+600	+13.6	1000	335	16	12.0	200	1.7	2.5	+4	+0.22	280	+0.8	+40	720	400
	7-12m		+520	+10.6						1.7	2.4	+4	+0.16	280				
Infants	0-6 m*	5.8	530	7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6-12m	8.5	660	9.0	-	-	2	2.0	130	-	-	-	0.5	71	1	-	170	-
Children	1-3y	12.9	1110	10.0	400	73	6	2.8	65	0.6	0.8	6	0.8	97	1	24	180	400
	4-6y	18.3	1360	13.0	450	104	8	3.7	80	0.8	1.1	8	1.0	111	1	27	240	
	7-9 y	25.3	1700	19.0	500	144	10	4.9	80	1.0	1.3	10	1.3	142	2	36	290	
Boys	10-12y	34.9	2220	27.0	650	199	12	7.0	100	1.3	1.7	12	1.7	180	2	45	360	400
Girls	10-12y	36.4	2060	27.0	650	207	16	7.1	100	1.2	1.6	12	1.6	186	2	44	370	400
Boys	13-15y	50.5	2860	36.0	800	287	15	11.9	100	1.6	2.2	16	2.2	238	2	60	430	400
Girls	13-15y	49.6	2400	35.0	800	282	17	10.7	100	1.3	1.9	13	1.8	204	2	55	420	400
Boys	16-18y	64.4	3320	45.0	850	367	18	14.7	100	1.9	2.5	19	2.5	286	2	70	480	400
Girls	16-18y	55.7	2500	37.0	850	317	18	11.8	100	1.4	1.9	14	1.9	223	2	57	400	400

* Adequate Intake (AI)

** There is no RDA for energy, the EAR for energy is equivalent to the Estimated Energy Requirement (EER)

Note: For adequate intake of Biotin and Pantothenic acid, refer to the text on summary of recommendations.

DAILY NUTRIENT RECOMMENDATIONS FOR THE ELDERLY IN INDIA - 2020

Nutrients		Energy (Kcal)*	Dietary Fibre	Protein (gr)	Vit-A (µg)	Thiamin B_1(mg)	Ribo flavin B_2 (mg)	Niacin (mg)	Vit-C (mg)	Vit-B_6 (mg)	Folate (µg)	Vit-B_{12} (µg)	Vit-D (IU)	Cal cium (mg)	Magne-sium (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)
Men ≥60 Yrs	EAR	1700	-	42.9	460	1.2	1.6	12	65	1.6	250	2.0	400	800	370	11	14	95
	RDA	-	32	54.0	1000	1.4	2.0	14	80	1.9	300	2.2	800†	1200	440	19	17	150
Women ≥60 Yrs	EAR	1500	-	36.3	390	1.1	1.6	9	55	1.6	180	2.0	400	800	310	11	11	95
	RDA	-	25	45.7	840	1.4	1.9	11	65	1.9	200	2.2	800†	1200	370	19	13.2	150

*: There is no RDA for Energy. The EAR is equivalent to the Estimated Energy Requirements (EER)

ACCEPTABLE MACRONUTRIENT DISTRIBUTION RANGE (AMDR) BY AGE AND PHYSIOLOGICAL GROUPS AS PERCENT OF ENERGY (%E)

Age group / Nutrients	1-2 years	3-18 years	Adults	Pregnant and lactating women
Protein (PE ratio)*	5-15	5-15	5-15	5-15
Total Fat	30-40	25-35	15-35	20-35
n-6 PUFA#	4-10	4-10	4-10	4-10
n-3-PUFA	0.5-1	0.5-1	0.5-1	0.5-1
Carbohydrate	40-60	45-65	45-65	45-65

*Depends on protein quality and total energy intake

n-6 to n-3 ratio should be between 5-10:1

Note: For good health, adults should consume minimum of 100 to 130g of carbohydrates and atleast 20g fats (food sources)

SUMMARY OF RECOMMENDED INTAKES FOR OTHER MINERALS AND TRACE ELEMENTS

SNo.	Minerals/ Trace Element	Recommended intake (per day)
1	Phosphorous	1000 mg
2	Sodium	2000 mg
3	Potassium	3500 mg
4	Copper	2 mg
5	Manganese	4 mg
6	Chromium	50 µg
7	Selenium	40 µg

TOLERABLE UPPER LIMIT (TUL) FOR NUTRIENTS - 2020

Age Group	Category of work	Protein (PE ratio)	Calcium (mg/d)	Magnesium* (mg/d)	Iron (mg/d)	Zinc (mg/d)	Iodine (µg/day)	Niacin (mg/d)	Vit. B6 (mg/ d)	Folate (µg/d)	Vit. C (mg/d)	Vit. A (µg/d)	Vit. D (IU/d)
Men	Sedentary Moderate Heavy	<40%	2500	350	45	40	1100	35	100	1000	2000	3000	4000
Women	Sedentary Moderate Heavy	<40%	2500	350	45	40	1100			1000	2000	3000	
	Pregnant woman	<30%	2500	350	45	40	1100	-	-	1000	2000	3000	4000
	Lactation 0-6m 7-12m	<40%	2500	350	45	40	1100	-	-	1000	2000	3000	4000
Infants	0-6 m	<15%	–	-	40	4	-	-	-	-	-	600	1000
	6-12m	<15%	–	-	40	5	-	-	-	-	-	600	1500
Children	1-3y 4-6y 7-9 y	<15% <15% <15%	1500 2500 2500	65 110 110	40 40 40	7 12 12	200 300 400	-	-	- - 300	350 550 800	600 900 900	2500 3000 3000
Boys	10-12y	<15%	3000	350	40	23	600	-	-	600-800 (9-17y)	1050	1700	4000
Girls	10-12y	<15%	3000	350	40	23	600	-	-	-	1300	1700	4000
Boys	13-15y	<15%	3000	350	45	34	900	-	-	-	1550	2800	4000
Girls	13-15y	<15%	3000	350	45	34	900	-	-	-	1800	2800	4000
Boys	16-18y	<15%	3000	350	45	34	1100	-	-	-	1950	2800	4000
Girls	16-18y	<15%	3000	350	45	34	1100	-	-	-	2000	2800	4000

The TUL is the maximum level of habitual intake from all sources of a nutrient or related substance judged to be unlikely to lead to adverse health effects in humans

*Note: TUL values are only for non-dietary pharmacological doses.

Dietetics **is a branch of nutrition which Deals with the study of diets in health and disease. Diet in disease is known as Diet therapy, Diet therapy or therapeutic nutrition.**

Diet therapy **refers to the use of diet (food and drinks) not only in the case of sick but also in the prevention of disease and maintenance of health.**

SCOPE OF NUTRITON AND DIETETICS

After having attained training and expertise in nutrition and dietetics, the knowledge can be widely used in the field of teaching, research, hospital dietetics or public health nutrition. In view of the wide prevalence of malnutrition, especially in our country, it becomes important that nutrition knowledge be dissipated to the masses. Trained personnel can aptly act as nutrition and health educators especially in various developmental programmes directed towards the upliftment of the economically weaker and ignorant section of our society.

Meal planning involves planning of balanced meals which are colourful attractive, appetizing, palatable and within the economic means of the individuals concerned.

ESSENTIAL OF MEAL PLANNING

The major objective of planning meals is to achieve nutritional adequacy along with the consideration of food availability, food habits, food preferences, purchasing power and other essential factors, which are discussed below.

1. **Nutritional Adequacy**
2. **Food cost and Economy**
3. **Acceptability of Meals**

The food exchange list

The food exchange list are used in meal planning to make a quick and fairly accurate estimation of the nutritive value of diets.

These are used to calculate the energy, carbohydrate, fat and protein content of the meals.

The exchange lists were first published by a joint Committee of the American Dietetics Association, American Diabetic Association and the US Public Health Services in 1950, and were revised in 1976.

Table 4.1 Comprehensive Food Exchange List

Food Exchange	Raw Food		Protein (g)	Carbo-hydrate (g)	Fat (g)	Energy (kcal)
	Amount (g)	Measure				
Milk	250ml	1 C	8	12	10	170
Meat	40	1 egg	7	neg.	5	70
Pulse	30	3 T	7	17	neg.	100
Cereal/ Starch	20/variable	1 bread slice	2	15	neg.	70
Vegetable A *	100	1/2C	neg.	neg.	neg.	neg.
Vegetable B	variable	–	2	7	neg.	40
Fruit	variable	1 portion	neg.	10	neg.	40
Fat	5	1 t	–	–	5	45
Sugar	5	1 t	–	5	–	20

* Two exchanges of vegetable A are calculated as one exchange of vegetable B.

USES OF FOOD EXCHANGE LIST IN MEAL PLANNING

As already discussed, planning of meals by using food exchange list is simpler and quicker.

To illustrate the use of food exchange list in planning meals, a day's sample diet for an adult male belonging to middle- income group engaged in sedentary activity is described below. The steps involved include.

Step I

Record Personal Data

Age	:	30 years
Sex	:	Male
Height	:	163cm
Weight	:	60kg
Physical activity	:	Sedentary
Socio-economic status	:	Middle income group
Physiological state	:	Normal
Food habits	:	Non-vegetarian.

Step II

Determine the Recommended Dietary Allowances (RDA) using ICMR tables

Energy	2425 kcal
Protein	60 g
Calcium	400 mg
Thiamine	1.2 mg

Step III

Estimate the amount of different ***Food Exchanges*** that will provide the required energy and protein keeping in mind the food preferences of the individual.

Food Exchange	Number of Exchanges	Energy (kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk	2	340	16	24	20
Meat	1	70	7	–	5
Pulse	2	200	14	34	–
Cereal/Starch	16	1120	32	240	–
Vegetable A	2	40	2	7	–
Vegetable B	3	120	6	21	–
Fruit	2	80	–	20	–
Fat	8	360	–	–	40
Sugar	5	100	–	25	–
Total		2425	77	373	65

The following steps are involved in the preparation of the above Food Exchange Plan :

(a) First estimate the number of protein exchange *i.e.*, milk, meat and pulse, according to socio-economic status and food habits. These protein exchanges are interchangeable to some extent, to meet the protein needs in daily diets for different socio-economic groups.

(b) Next estimate the appropriate number of cereal exchanges needed. As Indian diets are largely made up of cereals, this will provide the bulk of energy and also a significant amount of protein.

(c) A judicious selection of vegetable, fruit, fat and sugar exchanges, according to socio-economic status (SES), will make up the remaining energy needs. Fat and sugar adds to the palatability of the diet. However, excessive use of these should be avoided, as it will reduce the number of other food exchanges being used.

Step IV

Distribute the above *Food Exchanges between different meals*. Each meal should be nutritionally balanced, containing foods from all the food groups. The main meals, *i.e.*, breakfast, lunch and dinner should each provide about one third of total day's energy and protein needs.

Exchange	Total Number	Breakfast	Lunch	Evening Tea	Dinner
Milk	2	0.6	0.4	0.2	0.8
Meat	1	1	–	–	–
Pulse	2	–	1	–	1
Cereal/starch	16	4	5	3	4
Vegetable A	2	–	1	–	1
Vegetable B	3	–	1	5	1.5
Fruit	2	1	–	–	1
Fat	8	1	2	2	3
Sugar	5	2	–	1	2

Step V

Use the food exchanges provided in each meal for selecting specific foods (refer to the detailed exchanges). Select foods on the basis of SES, food preferences and seasonal availability. *Plan Menu*, keeping in mind the general principles of meal planning.

Meal	Food Exchange	Number of Exchanges	Food item	Amount * (g)	Menu
Breakfast	Milk	0.6	Milk	150	Cracked wheat porridge
	Meat	1	Eggs	50 (1 no.)	Poached eggs
	Cereal/starch	4	Cracked Wheat	20	Hot buttered toast
			Bread	90 (3 slices)	Apple
	Fruit	1	Apple	75	Cup of Tea/Coffee
	Fat	1	Butter	5	
	Sugar	2	Sugar	10	
Lunch	Milk	0.4	Curd	100	Dal palak
	Pulse	1	Moongdal	30	Beans and potato vegetable
	Cereal/starch	5	Rice	40	Cucumber raita
			Wheat flour	40	Boiled rice
			Potato	60	Chappati
	Vegetable A	1	Cucumber	50	
			Spinach	50	
	Vegetable B	1	French Beans	75	
			Onion	25	
	Fat	2	Oil	10	

Meal	Food Exchange	Number of Exchanges	Food item	Amount * (g)	Menu
Evening Tea	Milk	0.2	Milk	50	Peanut upma
	Cereal/starch	3	Suji	60	Cup of Tea/Coffee
	Vegetable B	0.5	Peas and Carrots	30	
	Fat	2	Peanuts	15	
			Oil	5	
	Sugar	1	Sugar	5	
Dinner	Milk	0.8	Milk	200	Khatta channa
	Pulse	1	White channa	40	Stuffed tinda
	Cereal/starch	4	Wheat flour	70	Cabbage and tomato salad
			Custard Powder	10	Chappati/Kulcha
	Vegetable A	1	Tinda	100	Fruit custard.
	Vegetable B	1.5	Cabbage	75	
			Tomato	100	
			Onion	25	
	Fruit	1	Seasonal Fruit	100	
	Fat	3	Oil	15	
	Sugar	2	Sugar	10	

Step III (Modified for HIG) Food Exchange Plan

Food Exchange	No	Energy (kcal)	Protein (g)	Carbohydrate (g)	Fat (g)
Milk	3	510	24	36	30
Meat	2	140	14	–	–
Pulse	1	100	7	17	–
Cereal/starch	13	910	26	195	–
Vegetable A	2	40	2	7	–
Vegetable B	2	80	4	14	–
Fruit	3	120	–	30	–
Fat	9	405	–		45
Sugar	6	120	–	30	–
Total		2425	77	329	75

Thus we see that planning meals using food exchange list is easy and quick. With the given distributions of exchanges (Step IV), a number of menus can be developed from a single exchange plan, while controlling the energy, protein, carbohydrate and fat content of the diet. Therefore, by using a particular food exchange plan, it is possible to plan menus with variation from day to day, season to season and region to region.

Exercises

1. Using the Food Exchange Plan for an adult man belonging to MIG listed in step III, plan a different menu using the same or a different distribution of exchanges
2. Work on steps IV and V for the Food Exchange Plan of an adult man belonging to LIG and HIG, respectively.