



Cover Page



## ROLE OF NUTRITION IN PHYSICAL AND MENTAL WELLBEING

**Dr Shweta Chand**

Professor, Department of Chemistry

Christ Church College

Kanpur, Uttar Pradesh, India

### Abstract

We are indulged in a lot of daily activities. To carry out these activities a large amount of energy is required, this energy comes from the proper diet we consume. Proper diet provides the energy which is necessary for growth, repair and other life processes. This all comes under the life process called Nutrition. Nutrition is the biochemical and physiological process by which an organism uses food to support its life. In addition, nutrition is concerned with social, economic, cultural and psychological implications of food and eating. So, nutrition science is the area of knowledge regarding the role of food in maintenance of health. Nutrients are the constituents in food that must be supplied to the body in suitable amounts. These include carbohydrates, fats, proteins, minerals, vitamins and water. Chemical substances are obtained from the food and used in the body to provide energy, structural materials and regulating agents to support growth, maintenance and repair of body's tissues. Nutrients may also reduce the risks of some degenerative diseases.

**Keywords:** Energy, Diet, Growth, Nutrition.

### Introduction

Life can be sustained only with adequate nourishment. Man needs food for growth, development and to lead an active, productive and healthy life<sup>1</sup>. Health is defined by World Health Organization as the 'State of complete physical, mental and social wellbeing and not merely the absence of disease and infirmity'.

The essential requisites of 'health'<sup>2</sup> includes the following

- \*Achievement of optimal growth and development, reflecting the full expression of one's genetic potential.
- \*Maintenance of the structural integrity and functional efficiency of body tissues that is necessary for an active and productive life.
- \*Ability to withstand inevitable process of aging with minimal disability and functional impairment.
- \*Ability to combat diseases, such as
  - a) Resisting infections (immunocompetence).
  - b) Preventing the onset (and retarding the progress) of degenerative diseases such as cancer.
  - c) Resisting the effect of environmental toxins and pollutants.
- \*Mental health
- \*Social well- being is the ability to live in harmony with others.

All living organisms need Nutrients for proper functioning and growth. It is the process of taking food and converting it into energy and other vital nutrients required for life. Food is obtained for growth and development by an individual. Better nutrition is related to improved mental health and stronger immune system. A healthy diet throughout life helps to maintain ideal body weight and reduces the risk of chronic disease leading to overall health.

### Proteins

Proteins are the "building blocks of life" and are necessary for good health<sup>3-4</sup>. Proteins are made of chains of up to 20 different amino acids. During digestion, proteins are broken down into amino acids for the body to use. Amino acids are generated by the body or obtained through the food. There are eight "essential" amino acids that cannot be made by adult bodies and must be eaten. "Complete" proteins contain all the essential amino acids in adequate amounts. Foods with complete proteins include meats and animal products such as milk, yogurt, cheese, and eggs. Soyabean proteins, as in tofu or "soya milk," are also complete proteins.

### Importance of Protein

- \* Provides needed components for gene and cell reproduction.
- \* Carry out the instructions of the genes in the cells.
- \* Form a major part of muscle, including the heart.
- \* Make up tendons and most connective tissues.



Cover Page



- \* Help make up collagen and cartilage, which determines the shape of the skeleton.
- \* Direct and control the chemical reactions of life as enzymes.
- \* Direct and balance body functions as hormones.
- \* Repair body damage by forming scar tissue.
- \* Defend against infections as antibodies.

**Carbohydrates:** Most carbohydrates<sup>5</sup> (“hydrated of carbon”) contain atoms from one water molecule (H<sub>2</sub>O) for each atom of carbon (C). A monosaccharide is the basic dietary carbohydrate and has six carbons. Examples are glucose, fructose, and galactose. Glucose is the sugar in blood. Fructose is twice as sweet as glucose and found in fruits. Galactose is less sweet than glucose and present in milk. Disaccharides forms when two monosaccharides join together. Starches in vegetables and grains are long chains or polymers of glucose. Corn starch is broken into short chains of glucose to make corn syrup; using special enzymes makes high fructose corn syrup, a popular sweetener. Cellulose is also a long chain or polymer of glucose. It is one of several indigestible carbohydrates called fibre.

### Importance of Carbohydrate

- \* Provide energy for brain, muscle, and other body functions.
- \* Combine with proteins or fats to form important parts of cartilage, connective tissue, the nervous system, and the immune system.
- \* Help to stool softness and normal bowl function as fibre. Large amounts of fibre in the bowl can ferment to produce gas (flatus)

**Fats:** Fats are mostly made of carbon and hydrogen and do not mix well with water. Most dietary fats, called triglycerides, are made with three fatty acids<sup>6-7</sup>. Fatty acids can be saturated (full of hydrogen), monounsaturated, or polyunsaturated, depending on how much of hydrogen can be added to them. Saturated fats provide concentrated energy, that tend to be solid (e.g., in butter and lard), and promote high blood cholesterol. Monounsaturated fats are a healthy form of concentrated energy (e.g., in olive, canola, and peanut oils) and are less likely to spoil than polyunsaturated fats. Certain polyunsaturated fatty acids (PUFA) in the diet are essential to good health and cannot be made by humans.

### Importance of Fats

- \* Cell membranes are layers of fat which form cell walls and chambers. They keep fluids separate for chemical reactions characteristic of life and require essential fatty acids to function normally.
- \* Fat is important insulation. Fat just below skin insulates the body from extreme temperatures. Layers of fat around important organs insulate them from physical shock or injury. A special fat forms the layer around nerve cells that “electrically” insulates them from each other. Multiple sclerosis is an example of a condition where this layer is damaged.
- \* Fat is an efficient way to store energy. A pound of fat contains about 3500 calories. Fats contain 9 calories in each gram as compared to 4 for proteins and carbohydrates. If energy was stored as carbohydrates instead of fats, then body weight could be 30% greater.
- \* Cholesterol performs several functions. It stabilizes cell membranes. It is the basis for some hormones (e.g., hydrocortisone, estrogen, and testosterone) and for the production of vitamin D by sunlight on skin. It is the basis for bile salts which help digestion of fat.

### Minerals

**Macro-minerals:** Minerals that are required in large amounts in the diet. Over 200 mg of each macro- mineral is in a normal daily diet. Electrolytes include sodium, potassium, and chloride. Generally, they are adequate in the diet. They can become unbalanced if dehydration occurs. Fruits, vegetables, and meats are good sources of electrolytes. Calcium, the most abundant mineral in the body. 99% of the body’s calcium is combined with phosphorus in the skeleton to make bones strong. 1% of the body’s calcium is in various body and tissue fluids. This calcium is important for muscle tone, muscle contraction, and nervous system functions. Muscle cramping may be an early symptom of low blood calcium. Excellent diet sources include milk, yogurt, cheese, sardines, tofu, soy milk, and canned salmon (with bones). If foods like these are not eaten, then a calcium supplement should be considered with meals and green leafy vegetables included in the diet, particularly for women. Inadequate intake of calcium leads to early osteoporosis and complicating fractures. Most bone calcium content accumulates by the end of adolescence and completes by about age 30. After that, skeletal calcium tends to decrease, especially in women after menopause. It is particularly critical for young women to maximize their bone mineral content before childbearing begins and to pay serious attention to calcium and vitamin D intake throughout their lives.



Cover Page



**Microminerals:** Minerals that are required in very small amounts in the diet. Less than 20 mg of each micromineral is in a normal daily diet, but each is essential for life and health. Microminerals are important helpers in various reactions throughout the body. Some important microminerals are iron, iodine, zinc, copper, selenium, fluorine, and chromium. Iron makes up a central part of haemoglobin in red blood cells. It carries life-giving oxygen throughout the body. Insufficient iron or copper are two causes of anemia (low red blood cell count), which results in paleness, fatigue, tiredness, and loss of energy. Menstruating women lose blood regularly and easily develop iron deficiency. Iron deficiency in the cells, even in the absence of anemia, also leads to tiredness, fatigue, and decreased energy. Good sources of iron include meat, fortified cereals, beans, green leafy vegetables, and whole grains. Human milk contains little iron. However, it is generally sufficient for the first 6 months of life. After that, the infant diet should include additional sources of iron. If iron deficiency occurs, then a supplement is needed.

**Vitamins:** Vitamins are organic compounds essential for life and health though present in very small amounts. Fat-soluble vitamins (vitamin A, vitamin D, vitamin E, and vitamin K) can be stored in the body. It can be toxic if consumed in large amounts. Water-soluble vitamins (B vitamins, vitamin C, and choline) can easily be excreted in the urine if consumed in large amounts. They do not generally reach toxic levels. They must be replaced frequently, preferably daily.

Vitamin	Name	Sources	Deficiency effects
Vitamin A	retinol, retinal, retinoic acid	Preformed vitamin A is found only in animals or supplemented foods. It is generally made by converting compounds in yellow and green vegetables.	Impaired vision, night blindness, dry eyes, destruction of the cornea, and total blindness. Other effects include impaired immunity, anemia, thickened cells in breathing passages and urinary bladder, and damaged teeth.
Vitamin D	cholecalciferol, ergocalciferol	Fish, fish oils, and fortified foods. Most is made by converting a compound in the skin when exposed to sunlight.	A deficiency in childhood leads to the bone deformities of rickets. In adulthood, thinning of the bones with muscle weakness is known as osteomalacia. Reduced bone mineral density and fragile bones is called osteoporosis.
Vitamin E	tocopherols, tocotrienols	Almonds, sunflower seeds, sunflower oil, peanuts, hazel nuts, and corn oil.	Deficiency is rare. It usually appears as nerve problems in hands and feet but also as anemia in premature infants.
Vitamin K	phylloquinone, menaquinone	Bacteria in the gut, cabbage, cauliflower, spinach, other green leafy vegetables, cereals, soybeans, and other vegetables.	Impaired blood clotting, poor mineralization of bone.

**Water:** About 60% of the body is water. Virtually all body functions depend on it. An average of 2–2.5 litres (or quarts) is lost on a normal, quiet day at sea level. Water in food replaces about 20% of the water lost. Plain water and other beverages replace 80% of the water lost. The average adult drinks 2.2–3.0 litres (9–12 cups) of fluids each day. This amount in deciliters should be equal to about one-third of the body weight in kilograms. This amount in fluid ounces should be equal to about one-half the body weight in pounds. Daily fluid needs can be more than double due to higher elevation, higher temperature, lower humidity, more exercise, and wrong clothing. Water losses are still significant even while just sitting in air-conditioned comfort. Caffeine or guarana found in many “power drinks” may cause extra water loss in urine and increase fluid needs. The best beverage choice is safe water or, in specific cases when salt losses are high such as with heavy sweating, a high-quality sports beverage.

What happens if a person does not get enough water:

Dehydration (weight reduction due to net water loss) can cause significant problems. Reduced physical and mental function can begin to occur after only 1%-2% water loss. Other symptoms include headache, dry eyes, irritability, and sleepiness. Muscle cramps and salt loss often occur. Impairment worsens as dehydration increases. Thirst can indicate dehydration but water loss is already significant by the time someone becomes thirsty. It is best to drink enough fluids to avoid these problems.



Cover Page



## References

1. Mattila P, Konko K, Eurola M, “Contents of vitamins, mineral elements, and some phenolic compounds” *Journal of Agricultural and Food Chemistry*. 49(5): 2343-2348 (2001).
2. Kenneth J. Carpenter: A Short History of Nutritional Science: Part 3 (1912–1944). In: *The Journal of Nutrition*, Volume 133, Issue 10, October (2003), Pages 3023–3032.
3. Chang, S.T & Miles, P.G, “Nutritional value, Medicinal Effect and Environmental Impact” CRC Press. 480 P (2004).
4. Dickman C, Malcolm K, “Consumer perception and insights on fats and fatty acids: knowledge on the quality of diet fat.” *Ann Nutr Metab*. 54(Suppl 1): 25-32 (2009).
5. -Erjavec J, Kos J, Ravnikar M, Dreo T, Sabotic J, “Proteins of higher fungi- from forest to application” *Trends in Biotechnology*, 30(5): 259-273 (2012)
6. Hornell A, Lagstrom H, Lande B, Thorsdottir I. Protein intake from 0 to 18 years of age and its relation to health: a systematic literature review for the 5th Nordic Nutrition Recommendations. *Food Nutr Res* (2013); 57: 21083.
7. Pearce J, Langley-Evans SC. The types of food introduced during complementary feeding and risk of childhood obesity: a systematic review. *Int J Obes (Lond)* (2013); 37(4): 477–85.
8. Farhud D D, Malmir M, Khanahmadi M.” Happiness as a healthy style” *Iraninan Academy of Medical Science*. (2015).
9. Hardy K, Brand-Miller J, Brown K.D, Thomas M.G, Copeland L. “The importance of dietary carbohydrate in human evolution” *Q Rev Biol*. 90:251-68. (2015).
10. Ann G. Liu, Nikki A. Ford Penny M. Kris-Etherton, “A healthy approach to dietary fats: understanding the science and taking action to reduce consumer confusion” *Nutrition Journal* (2017).
11. Dariush Mozaffarian, Irwin Rosenberg Ricardo Uauy (13 June 2018): History of modern nutrition science—implications for current research, dietary guidelines, and food policy. In: *BMJ* (2018).
12. Ferre N, Luque V, Closa-Monasterolo R, Zaragoza-Jordana M, Gispert-Llaurado M, Grote V, et al. Association of protein intake during the second year of life with weight gain-related outcomes in childhood: a systematic review. *Nutrients* (2021); 13(2): 583
13. Kim Hyeong Nam, Choi Hojae, Shahzad Muhammad Zafar, Ki Heesoo, “Supramolecular assembly of protein building blocks: from folding to function” *Springer open* 9(4) (2022).