

Nutrition and its Impact on Health: A Comprehensive Overview

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ABSTRACT

Nutrition plays a pivotal role in maintaining overall well-being and helps in prevention of various chronic diseases. For prevention and management of conditions such as obesity, diabetes, cardiovascular diseases, and certain cancers importance of nutrition acts as a cornerstone of preventive medicine and public health. A balanced and nutritious diet is crucial for optimal growth, development, and the maintenance of physiological functions throughout life. Adequate intake of macronutrients (carbohydrates, proteins, and fats) provides the energy necessary for daily activities and metabolic processes. Essential vitamins and minerals play a vital role in various physiological functions. The gut microbiome, composed of trillions of microorganisms, is influenced by diet and, in turn, affects digestion, nutrient absorption, and overall health. Probiotics and prebiotics, found in certain foods, contribute to a healthy gut microbiome, impacting immune function and inflammation. A well-balanced and varied diet is fundamental to promoting and maintaining overall health and well-being throughout the life span. Good nutrition is a key component of a healthy lifestyle. It provides your body with the necessary nutrients to function properly, maintain energy levels, support growth and development, and prevent chronic diseases. A well-balanced diet rich in fruits, vegetables, whole grains, and lean proteins has been associated with a lower risk of chronic diseases, including cardiovascular diseases, certain cancers, and type 2 diabetes. Additionally, incorporating regular physical activity and adopting stress management techniques can complement a healthy diet in promoting overall mental well-being. In this review article impact of nutrition on health has been discussed.

Keywords: Nutrition, Chronic diseases, Vitamins, Minerals and Balanced diet

INTRODUCTION

Nutrition plays a pivotal role in maintaining overall well-being and helps in prevention of various chronic diseases. Food is essential for life and providing energy to the body, as a result our body can perform different functions. Proper nutrition helps in building up of body cells, tissues and organs. As a result, maintaining good health depends on proper diet which prevents body from diseases. A balanced diet is comprised of protein, carbohydrates, fats, fiber, vitamins, and minerals, it is crucial for optimal growth, development, and the maintenance of physiological functions throughout life. Adequate intake of macronutrients (carbohydrates, proteins, and fats) provides the energy necessary for daily activities and metabolic processes. Essential vitamins and minerals play a vital role in various physiological functions. The gut microbiome, composed of trillions of microorganisms, is influenced by diet and, in turn, affects digestion, nutrient absorption, and overall health. Probiotics and prebiotics, found in certain foods, contribute to a healthy gut microbiome, impacting immune function and inflammation.

AIM

- In this article nutrition and its components have been discussed.
- To provide knowledge about diseases like diabetes, cardiovascular diseases like hypertension and heart disease, obesity, and certain types of cancer.
- To provide knowledge about the balanced diet and health management.

METHODOLOGY

This study is based on secondary data which includes published academic literature. Therefore, an extensive literature review was conducted for the same. The literature search was done on an available public domain such as Google Scholar, PubMed, Springer, Elsevier journals. The keywords used for the search included, nutrition, balanced diet, cardiovascular diseases, diabetes, obesity and health management.

DISCUSSION

The main components of nutrients are carbohydrates, fats, fiber, minerals, proteins, vitamins, and water (White & Ross, 2018). These can be classified as macronutrients or micronutrients.

Carbohydrates, fats and proteins are known as macronutrients which provide energy (Lean & Michael, 2015). Water and fiber are macronutrients but do not provide energy (Fuhrman & Joel

,2014). The micronutrients include minerals and vitamins(WHO,2004). A healthy, balanced diet supports the immune system and reduces the risk of illness. Several nutrients are essential for immune system function. Probiotics are found in fermented foods such as yogurt, kefir, and sauerkraut. These beneficial bacteria help maintain the gut microbiome' s balance (Table:1). Essential vitamins and minerals play a vital role in various physiological functions.

Vitamins : Thiamin (B1), Riboflavin (B2), Niacin (B3) and Pantothenic acid (B5) are water soluble vitamins act as Coenzyme and assist in energy metabolism. Pyridoxine (B6) helps in amino acid synthesis assistance, Biotin (B7) assist amino acid, and fatty acid metabolism. Folate (B9) is essential for growth and Cobalamin (B12) synthesize red blood cell while C (ascorbic acid) is antioxidant helps in Collagen synthesis. Various vitamins , their source , functions and diseases due to deficiency are tabulated in the Table:2.

Minerals: These are also essential components of balanced diet. They may be macrominerals or are required in trace amount. These are tabulated in Table :3.

Table:1: Main components of nutrition

Source	Functions
Carbohydrates : The major food sources of carbohydrates are grains, milk, fruits, and starchy vegetables like potatoes.	These are source of energy for the body and help in the formation of cells.
Protein: These include meats, dairy products, soya products, seafood, and various plant-based foods .	These are essential for tissue formation, cell preparation, muscle formation. Proteins help in hormone /enzyme production and improve healthy immune system.
Fat: Lipids are found in butter, oils, meats, dairy products, nuts, seeds, and processed foods.	Provides stored energy for the body and provides insulation to vital organ. They maintain body temperature functions as structural components of cells. Fats act as signaling molecules for proper cellular communication.

<p>Vitamins: There are thirteen vitamins classified as water-soluble or fat-soluble. The water-soluble vitamins are vitamin C and all the B vitamins, including thiamine, riboflavin, niacin, pantothenic acid, pyridoxine, biotin, folate, and cobalamin. The fat-soluble vitamins are A, D, E, and K.</p>	<p>These regulate body processes and help in normal functions of body-system.</p>
<p>Minerals: Minerals are inorganic substances may be micro and macrominereals. Trace minerals are required in a few milligrams such as molybdenum, selenium, zinc, iron, and iodine. Macrominerals are required in hundreds of milligrams such as calcium, magnesium, potassium, sodium, and phosphorus.</p>	<p>These are necessary for proper cellular function and regulate body processes.</p>
<p>Water: About 70 percent of total body weight is water.</p>	<p>Water transports essential nutrients to all body parts. It also transports waste products for disposal, and maintain body temperature .</p>

Table:2: Vitamins

Vitamins	Source	Functions
Vitamin A (retinol)	Vitamin A–fortified dairy products ,fish liver oils, liver, egg yolks, butter. As provitamin carotenoids: dark green and yellow vegetables, carrots, yellow and orange fruits.	Formation of rhodopsin in the retina, Integrity of epithelia, Lysosome stability and Glycoprotein synthesis
Vitamin A Deficiency: Night blindness, xerophthalmia, keratomalacia, increased morbidity and mortality in young children and perifollicular hyperkeratosis		
Thiamin (Vitamin B1)	Whole grains, meat enriched cereal products, nuts, legumes and potatoes etc.	Helps in metabolism of carbohydrate, fat, amino acid and glucose. It is required for central and peripheral nerve cell function and myocardial function.
Thiamin (Vitamin B1)Deficiency: Beriberi (peripheral neuropathy, heart failure), Wernicke-Korsakoff syndrome		
Riboflavin (Vitamin B2)	Milk, cheese, liver, meat, eggs and cereal products	Helps in carbohydrate and protein metabolism Integrity of mucous membranes
Riboflavin (Vitamin B2)Deficiency: Cheilosis, angular stomatitis, corneal vascularization		
Vit. B6 (pyridoxine, pyridoxal, pyridoxamine)	Organ meats whole-grain cereals, fish and legumes	Nucleic acid biosynthesis, Fatty acid, lipid, and amino acid metabolism

		Many aspects of nitrogen metabolism (eg, transaminations, porphyrin and heme synthesis, tryptophan conversion to niacin)
Vitamin B6 Deficiency: Seizures, anemia, neuropathies, seborrheic dermatitis		
Vit.B12 (cobalamins)	Meats (especially beef, pork, and organ meats [eg, liver]), poultry, eggs, fortified cereals, milk and milk products	Maturation of red blood cells, neural function, DNA synthesis, myelin synthesis and repair
Vitamin B12 Deficiency: Megaloblastic anemia, neurologic deficits (confusion, paresthesias, ataxia)		
<u>Folate</u> (folic acid)	Raw green leafy vegetables, fruits, organ meats (eg, liver), enriched cereals and breads	Maturation of red blood cells Synthesis of purines, pyrimidines, and methionine Development of fetal nervous system
Folic acid Deficiency: Megaloblastic anemia, neural tube birth defects, confusion		
Niacin (nicotinic acid, nicotinamide)	Liver, red meat, fish, poultry, legumes, whole-grain or enriched cereals and breads	Oxidation-reduction reactions Carbohydrate and cell metabolism
Niacin Deficiency: Pellagra (dermatitis, glossitis, gastrointestinal and central nervous system dysfunction)		
Vit. C (ascorbic acid)	Citrusfruits, tomatoes, broccoli, strawberries, sweet peppers	Collagen formation, Wound healing, Bone and blood vessel health Carnitine, hormone, and amino acid formation
Vitamin C Deficiency: Scurvy (hemorrhages, loose teeth, gingivitis, bone defects)		
Vit.D (cholecalciferol, ergocalciferol)	Direct ultraviolet B irradiation of the skin (main source), fortified dairy products (main dietary source), fish liver oils, fatty fish, liver	Helps in absorption of calcium and phosphate, Mineralization and repair of bone, Tubular reabsorption of calcium, Insulin and thyroid function, improvement of immune function, reduced risk of autoimmune diseases
Vitamin D Deficiency: Rickets (sometimes with tetany), osteomalacia		
Vit. E (alpha-tocopherol, other tocopherols)	Vegetable oils, nuts	Intracellular antioxidant Scavenger of free radicals in biologic membranes
Vitamin E Deficiency: Red blood cell hemolysis, neurologic deficits		
Vit. K (phylloquinone, menaquinones)	Green leafy vegetables (especially collards, spinach, and salad greens), soy beans, vegetable oils.	Formation of prothrombin, other coagulation factors, and bone proteins

	Bacteria in the gastrointestinal tract after neonatal period	
Vitamin K Deficiency: Bleeding due to deficiency of prothrombin and other factors, osteopenia		

Source: Merck & Co, Inc., Rahway, NJ, USA (known as MSD outside the US and Canada)

Table:3: Minerals

Minerals (Macro minereals)	Major Functions
<i>Sodium</i>	Fluid balance, nerve transmission, muscle contraction
<i>Chloride</i>	Fluid balance, stomach acid production
<i>Potassium</i>	Fluid balance, nerve transmission, muscle contraction
<i>Calcium</i>	Bone and teeth health maintenance, nerve transmission, muscle contraction, blood clotting
<i>Phosphorus</i>	Bone and teeth health maintenance, acid-base balance
<i>Magnesium</i>	Protein production, nerve transmission, muscle contraction
<i>Sulfur</i>	Protein production
Trace minereals	
<i>Iron</i>	Carries oxygen, assists in energy production
<i>Zinc</i>	Protein and DNA production, wound healing, growth, immune system function
<i>Iodine</i>	Thyroid hormone production, growth, metabolism
<i>Selenium</i>	Antioxidant
<i>Copper</i>	Coenzyme, iron metabolism
<i>Manganese</i>	Coenzyme
<i>Fluoride</i>	Bone and teeth health maintenance, tooth decay prevention
<i>Chromium</i>	Assists insulin in glucose metabolism
<i>Molybdenum</i>	Coenzyme

The gut microbiome, composed of trillions of microorganisms, is influenced by diet and, in turn, affects digestion, nutrient absorption, and overall health. Probiotics and prebiotics, found in certain foods, contribute to a healthy gut microbiome, impacting immune function and inflammation.

Nutrition and Diseases

Inadequate daily intake of diet is termed as undernutrition while malnutrition is the term for imbalance or inadequately in the quality of the diet (Boyd, 1950). Inadequate calorie intake results in insufficient physical development and less activity on the part of children. According to UNICEF, in 2011, 101 million children across the globe were underweight, 165 million, were stunted in growth and 43 million children under five were overweight or obese (WHO, 2013).

In developed countries, malnutrition may be due to nutritional imbalances or excessive consumption. Undernutrition, results in low weight-for-height, stunting and underweight. About 20% of young people and 42% of adults have obesity, type 2 diabetes, and some cancers and are at risk of heart disease in the United States.

In one of findings Iron deficiency affected 15% of the world population and anemia was observed in about 40% to 50% of children (Pollit, 1993). Iron is essential for neurologic activity, synthesis of dopamine, serotonin, catecholamine, and myelin formation (Beard et al., 1993).

Obesity and high sodium intake can contribute to ischemic heart disease. Overweight, obesity and diet-related diseases can cause heart disease, stroke, diabetes and some cancers. Cancer cases can be reduced by taking low-fat diet reduces (Black et al., 1995).

Cardiovascular diseases the diseases of the heart and blood vessels, is the leading cause of death in developed countries. Coronary heart disease (CHD), also known as coronary artery disease or ischemic heart disease, is the most common one. The deposits of fats and lipid making them stiff and causes narrowing of arteries atherosclerosis results in myocardial infarction (heart attack). Main leading causes of heart disease and stroke are high blood pressure and high blood cholesterol.

A high intake of food rich in free sugars results in a fast release of glucose into the blood and large amount of insulin, hormone that lowers the glucose levels in the blood. However, the abrupt increases in glucose and insulin cause glucose intolerance and insulin sensitivity, type-2-diabetes, and cardiovascular risk factors.

Most cancer-causing substances (carcinogens) enter the body through food and beverages intake. It is estimated that 30 to 40 percent of all cases of cancer could be prevented by appropriate dietary means. Obesity can lead to diseases like colorectal cancer, prostate cancer, uterine cancer, pancreatic and breast cancers. Unhealthy food and beverages, such as sugar-sweetened beverages and highly processed food, can lead to weight gain, obesity and other chronic conditions like cancer, including endometrial (uterine) cancer, breast cancer in postmenopausal women, and colorectal cancer. The risk of colorectal cancer is also associated with eating red and processed meat (National Center for Chronic Disease Prevention and Health Promotion, 2022).

DIET MANAGEMENT

Nutrition plays an important role for proper functioning of the body, therefore by managing the diet one can prevent from diet-associated diseases. Taking a balanced diet by including various components such as vitamins, carbohydrates, lipid, minerals etc. diseases can be controlled to some extent. Avoid unhealthy food and beverages, such as sugar-sweetened beverages and highly processed food that lead to weight gain and obesity. Avoid unhealthy food and beverages, such as sugar-sweetened beverages and highly processed food to escape from dreadful cancer. To prevent cardiovascular diseases, one must take a balanced diet with plenty of fibre, exercise regularly, maintain a healthy weight and body mass index and cut down on alcohol and stop smoking. In addition to this drinking plenty of water throughout the day is essential for various bodily functions and in maintaining overall health.

CONCLUSION

A well-balanced and varied diet is fundamental to promoting and maintaining overall health and well-being throughout the life span. Good nutrition is a key component of a healthy lifestyle. It provides your body with the necessary nutrients to function properly, maintain energy levels, support growth and development, and prevent chronic diseases. A well-balanced diet rich in fruits, vegetables, whole grains, and lean proteins has been associated with a lower risk of chronic diseases, including cardiovascular diseases, certain cancers, and type 2 diabetes. For prevention and management of conditions such as obesity, diabetes, cardiovascular diseases, and certain cancers, the importance of nutrition acts as a cornerstone of preventive medicine and public health.

REFERENCES

1. Australian dietary guidelines(2013). National Health and Medical Research Council, Australian Government.
2. Black, H.S., Thornby, J.I., Wolf Jr. J.E., Goldberg, L.H., Herd, J.A., Rosen, T., Bruce, S., Tschien, J.A., Scott, L.W., Jaax, S., Foreyt, J.P. and Reusser, B. (1995). Evidence that a low-fat diet reduces the occurrence of nonmelanoma skin cancer. *International Journal of Cancer*, 62(2): 165-169.
3. Boyd Orr J. (1950). The food problem. *Scientific American*, 183: 11-15.
4. Fuhrman & Joel (2014). *The End of Dieting*. Harper One (Harper Collins). pp. 101–02. ISBN 978-0-06-224932-6.
5. Lean & Michael E.J. (2015). "Principles of Human Nutrition". *Medicine*. 43 (2): 61–65. doi:10.1016/j.mpmed.2014.11.009. S2CID 220865321.
6. Merck & Co, Inc., Rahway, NJ, USA (known as MSD outside the US and Canada)
7. National Center for Chronic Disease Prevention and Health Promotion(2022).
8. Nutrient Reference Values for Australia and New Zealand, National Health and Medical Research Council, Australian Government.
9. Pollitt, E. (1993). Iron deficiency and cognitive function. *Annual Review of Nutrition*, 13: 521-537.
10. The best foods for vitamins and minerals, Harvard Health Medical School, United States.
11. UNICEF, WHO, World Bank. UNICEF-WHO-World Bank Joint child malnutrition estimates. New York, Geneva & Washington DC, UNICEF, WHO & World Bank, 2012.
12. White & Ross (2018). "7 essential nutrients your body needs". www.wellnessdaily.com.au.
13. World Health Organization, Food and Agricultural Organization of the United Nations (2004). *Vitamin and mineral requirements in human nutrition* (2. ed.). Geneva [u.a.]: World Health Organization.
14. World Health Organization (2013). *Essential Nutrition Actions: Improving maternal, newborn, infant and young child health and nutrition*. Washington, DC: WHO.

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