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A Review on Different Dietary Sources of Important Vitamins and Electrolytes

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ABSTRACT

The purpose of this article is to provide an overview of the most important research findings addressing the sources of micronutrients, particularly vitamins and electrolytes, in fruits, vegetables, oils, fish, beans, meat, grains, and other naturally occurring sources. All of the vitamins, minerals, and electrolytes will be categorized at the end of this article to make it easier to distinguish between them. Many people are unaware of their diet's precise vitamin and mineral composition. They frequently failed to recognize them because they did not know which foods included particular types of vitamins and electrolytes. To be aware of it and use it is a crucial health task. In today's world, maintaining excellent health is crucial. Various studies have investigated the effects of dietary patterns on the nutritional status and have concluded that unhealthy eating increases the risk of malnutrition. Compared to high-income countries, low- and middle-income countries have a higher frequency of malnutrition. The goal of this study was to provide information for an article that discussed micronutrients, trace minerals, multivitamins, vitamins, beta carotene, flavonoids, biotin, folic acid, riboflavin, and mineral density, among other topics. This review advances our knowledge of vitamin deficiency and its current state, possible treatments, and potential future developments. This study will help to provide a common platform for resource mobilization for the implementation of the micronutrient deficiency prevention programs.

KEYWORDS: Dietary sources, vitamins, electrolytes, requirements

1.1 INTRODUCTION

The two main categories of nutrients are macronutrients and micronutrients. Micronutrients are those that the body needs in very small amounts, whereas macronutrients are those that the body needs in big numbers. Micronutrients (vitamins, minerals, or electrolytes) are necessary for the body's correct operation, whereas macronutrients (carbohydrates, proteins, and fats) provide molecules for the structural and metabolic functions of the human body. Micronutrient requirements are influenced by an individual's life cycle and metabolic activities. Micronutrients are necessary for the appropriate growth of the fetus even during intrauterine life. Deficits in vitamin D, iodine, iron, and folic acid in particular may result in congenital diseases or even death. Although numerous academic articles have addressed the daily needed allowance of certain vitamins and minerals, the amounts of these micronutrients are not set. The requirement for micronutrients can be altered by activities like physical activity, pregnancy, early childhood, adolescence, old age, or particular diets (like veganism). To understand how micronutrients play a part in health and disease, it is crucial to evaluate their needs as well as the effects of scarcity.[1]

1.2 CLASSIFICATION OF VITAMINS

On the basis of their solubility vitamins are mainly 2 types.

Fat soluble vitamins: Vitamins that dissolve in fat. Because fat is easily stored on our body, fat-soluble vitamins can be stored within our fat. This means they can accumulate and be saved for later use. The fat-soluble vitamins are A, D, E and K.

Water soluble vitamins: Vitamins that dissolve in water. Because our body is a watery environment, these vitamins can move through our body pretty easily, and they can also be flushed out by the kidneys. Water soluble vitamins include the B-complex vitamins and vitamin C. There are eight B vitamins, including vitamin B1, B2, B3, B5, B6, B7, B9 and B12.

1.2.1 Vitamin A

Visual impairment, xerophthalmia, Bitot's spots, keratomalacia (softening of the thickness of the cornea), follicular hyperkeratosis, anorexia, growth retardation, respiratory and intestinal infections, and the degeneration of the myelin sheaths are all symptoms of vitamin A deficiency. Anorexia, vomiting,

and nausea may be brought on by an overabundance of vitamin A. The body uses vitamin A for a variety of processes, including immunity, bone formation, skin support, eye health (in dim light), skin development, and maintenance of epithelial tissue. Among the sources of vitamin A are:

Meat, fish, green mango, papaya, pumpkin, and yellow fruits and vegetables. Green leafy vegetables, germination cereals, and pulses. Eggs, spinach, cabbage, carrots, amaranth, angle liver oils, and cod liver oil are further sources.[2]

1.2.2 Vitamin B1

Thiamine, also known as vitamin B1, is a water-soluble coenzyme that goes by the name of thiamine Pyrophosphate. The metabolism of carbohydrates involves the vitamin thiamine pyrophosphate. The hexose monophosphate shunt also utilizes thiamine pyrophosphate. It functions as a neuroprotectant[3]. Nuts, potatoes, pork, beans, and cereals all contain thiamine. Beriberi is an illness brought on by its absence. Because polished rice removes the seed coat, which contains this vitamin, it is frequently seen in populations who eat polished rice. The three forms of beriberi are: infantile, wet, and dry[4]. Thiamine is required for the health of the heart, nerves, and muscles and serves as a co-catalyst in the digestion of sugar. Unmilled oat, wheat germ, beets, almonds, beef, lentils, potatoes, pork, eggs, poultry, dried beans, green peas, beans, and green, lush vegetables are all good sources of vitamin B1. Thiamine deficiency in alcoholics can result in beriberi, polyneuritis, mental confusion, ataxia, or Wernicke-Korsakoff syndrome. Tachycardia, migraines, or peevishness, a sleeping condition, might result from excess[5].

1.2.3 Vitamin B2

It is a yellow, crystalline chemical known as lactoflavin or riboflavin. Grain, milk, eggs, liver, oats, and lush green vegetables all contain riboflavin. It contributes to the respiration of tissues. Ariboflavinosis is a disorder brought on by its lack. Cheilosis (textured desquamation of the skin around the mouth), glossitis (sparkly red and painful tongue), sore lips, eye disturbances and photophobia (light sensitivity), greasy skin on the nose, and scrotal dermatitis are symptoms of ariboflavinosis[6].

1.2.4 Vitamin B3

reduces the risk of cardiovascular disease, lowers LDL cholesterol, and eases arthritis. It was discovered in animal products such liver, chicken, and lean red meat. Niacin is quite well-sourced in pea butter. Whole grain bread, cereal, coffee, tea, and other foods are additional helpful sources[7].

1.2.5 Vitamin B6

It belongs to the family of vitamins called B complex. It participates in hormonogenesis and energy synthesis as a component of coenzyme A and the fatty acid synthase. Patients with a pantothenic acid deficiency may suffer enteritis, baldness, or other dermatological disorders[8].

1.2.6 Vitamin B9

The synthetic version of folate, a water-soluble vitamin present in green leafy vegetables, fruits, and liver, is known as vitamin B9 or folic acid. The active form of vitamin B9, or folate, is tetrahydrofolate after conversion. It is a crucial component of the process that creates nucleic acids (DNA and RNA). Pregnant women should take supplements of folate as a prophylactic measure since folate deficiency can cause neural tube abnormalities. Megaloblastic anemia is a kind of macrocytic anemia that can also be brought on by folic acid insufficiency. This necessitates a differential diagnosis with vitamin B12 deficiency, which also brings on megaloblastic anemia[8].

1.2.7 Vitamin B12

Water-soluble vitamin B12 (cyanocobalamin) is present in meat, dairy products, fish, and eggs. In 2019, Hariz and Bhattacharya. It is necessary for the development of nerve cells as well as the correct generation of red blood cells by the bone marrow. Megaloblastic anemia and neurological abnormalities (ataxia, neuropathy, or even neuropsychiatric symptoms like dementia) are brought on by vitamin B12 insufficiency, which also damages myelin. Vitamin B12 is insufficiently present in vegan diets. When determining a possible cause of the anemic condition, folic acid deficiency—which can also result in megaloblastic anemia—should be taken into consideration[8].

1.2.8 Vitamin C

Vitamin C (ascorbic acid) is a crystalline solid which is soluble in water[9]. The majority of animals and plants can produce ascorbic acid, but only humans and primates have the enzyme gluconolactone oxidase, which is essential for the process' final stage. Therefore, the daily requirements for vitamin C in these species should come from diet. The finest sources of vitamin C are beef liver, oranges, lemons, grapefruit, leafy green vegetables, and citrus fruits[10]. Collagen, which strengthens connective tissues and is necessary for wound healing and healthy immunological function, can only be formed when vitamin C is present. Scurvy, a condition in which the collagen produced is unstable, is brought on by vitamin C insufficiency, which alters the connective tissue.

1.2.9 Vitamin D

Phosphorus and calcium are better absorbed from the colon and are better deposited in bones thanks to vitamin D. Sunlight exposure, liver, eggs, butter, cheese, fish liver oil, fortified meals, milk, and margarine are all sources of vitamin D. Additionally, vitamin D promotes regular bone mineralization and boosts phosphate absorption through the tubules. Additionally, it has antioxidant qualities[11]. The skin's capacity to synthesize vitamin D3 is reduced with age. Vitamin D levels in people decline to around 25% of the normal level after age of 70[12]. In the temperate zone, the cutaneous production of vitamin D3 is limited by the reduced ultraviolet radiations availability.

1.2.10 Vitamin E

A natural antioxidant and anti-sterility agent, vitamin E. Tocopherols or tocotrienols are names for vitamin E that are structurally related[13]. It contributes to immunity and wound healing. Wheat germ oil, nuts, cereals, meat, eggs, milk, green leafy vegetables, and other vegetables are sources of vitamin E. Cystic fibrosis, ataxia, and abetalipoproteinemia (a condition that prevents the normal absorption of fat and fat-soluble vitamins from meals) are all linked to vitamin E deficiency in humans, while testicular degeneration and recurrent miscarriages are linked to it in laboratory animals. Additionally, vitamin E deficiency in premature newborns can cause macrocytic anemia and increased hemolysis of red blood cells. Excessive vitamin E intake has been linked to headache, weariness, dizziness, intestinal irritation, protracted prothrombin time, and difficulty with the absorption of vitamins A and K.

1.2.11 Vitamin K

The primary role of vitamin K is the production of prothrombin in the liver, along with other clotting factors that depend on vitamin K, including protein C, protein S, VII, IX, and X, which are necessary for healthy blood coagulation. Fresh green leafy vegetables, lettuce, cabbage, egg yolk, soybean oil, and liver are all sources of it. The typical bacterial flora in our intestines allows our body to make vitamin K on its own[14].

1.3 ELECTROLYTES:

Electrolytes are inorganic elements that the body cannot produce on its own and must be received from food. They can be found in water and soil naturally. While some are extremely poisonous, others are necessary to all living things. Significant amounts of electrolytes and minerals are absorbed by plants from the environment, and they typically pass on to animals as they move up the food chain. Such nutritionally significant mineral deficiencies frequently result in death. 9 Types, Sources, and Uses of Vitamins and Minerals160 Essential components of the body are minerals. They are essential for the synthesis and operation of crucial biomolecules in the human body. Although, minerals are not a source of energy in the body but they are necessary for the maintenance of normal biochemical processes in the body[15]. Based on the body needs, these essential electrolytes can be classified as either a macro or micro minerals. Nutritionally significant minerals including salt, calcium, phosphorus, magnesium, and potassium are examples of macro-minerals. Because the typical adult daily need is larger than 100 mg/day, they are categorized as macronutrients[16].

Trace Elements: As the name suggests, trace elements are a collection of critical minerals that are required in very minute amounts for the daily metabolic functions of humans. Since their daily requirement should be under 100 mg and that amount can be harmful to health, they are regarded as trace elements. But a lack of any of these trace nutrients might cause major health problems[16].

1.3.1 Iodine

Seafood, iodized salts, eggs, dairy products, and water are all sources of iodine. It is crucial to the body's healthy physiologic growth and development. The production of thyroid hormones requires iodine. Nearly 2.6 billion people worldwide suffer from iodine deficiency. 50 million kids worldwide suffer from iodine deficiencies of varying severity[17]. Iodine must be consumed in minute amounts throughout one's lifespan because the body cannot store it. Iodine-fortified common salt has long been utilized as a successful intervention. Goiter development may result from iodine shortage. Iodine has a recommended dietary requirement of 40 micrograms per day. It is also prescribed in the form of povidone-iodine for use as a skin disinfectant and antiseptic[18].

1.3.2 Iron

Green leafy vegetables, dried nuts, beans, peas, egg yolk, red meat, kidney, and liver are good sources of iron. One of the most prevalent metals in the body, iron is necessary for life. It participates in the exchange of oxygen between blood and tissues since it is a part of myoglobin and hemoglobin. Iron is a component of enzymes involved in oxidation-reduction reactions, and it is found in the majority of cells. A significant amount of iron (246 mg) builds up in the body at birth. The mother's iron intake during pregnancy affects this iron storage. The greatest demand for iron is during the last 3 months of pregnancy. The developing fetus requires about 20–30 mg/day of iron in the pregnant woman. The iron in diet comes in the form of haem and non-haem. Haem has a higher bioavailability and can be found in meat, fish, poultry, and milk[19].

1.3.3 Magnesium

Hard water, spices, apricots, bananas, soybeans, nuts, green leafy vegetables, and whole grains are good sources of magnesium. It participates in the regulation of the cardiac cycle, the health of muscles and nerves, and the preservation of bone growth and integrity. Hypomagnesaemia and neuromuscular irritability are deficiency illnesses. Hypotension, respiratory failure, and heart abnormalities are toxicity signs[20][21].

1.3.4 Calcium

builds and secures teeth and bones. helps with blood coagulation, neuronal impulse transmission, and muscular contractions and relaxation. plays a part in both the activation and release of enzymes. maintains a healthy blood pressure level. found in milk, tofu, sardines, salmon, fortified drinks, yogurt, cheese, milk, and leafy green vegetables like kale and broccoli (but not spinach or Swiss chard, which have binders that reduce absorption).

1.3.5 Chromium

Enhances the activity of insulin, helps maintain normal blood glucose levels, and is needed to free energy from glucose. Found in Meat, poultry, fish, some cereals, nuts, cheese.

1.3.6 Copper

Organ meats, nuts, dry beans, whole grains, and cereals are sources of it. Due to the acidic pH of gastric juice, it is present in food as copper complexes and released in the stomach. Both hematopoiesis and the development of bones depend on it. It is largely absorbed in the small intestine via diffusion, with certain carriers used in very modest amounts. Copper and albumin join in the bloodstream, travel to the liver, and then are combined to form ceruloplasmin, which is then sent to the tissues. Through the bile, copper is eliminated through the feces, urine, skin, hair, and nails. It is tethered to ceruloplasmin and carried via albumin. It is a component of several enzymes, including tyrosinase, catalase, ferro-oxidase, and cytochrome oxidase[22].

1.3.7 Fluoride

Seafood, vegetables, grains, tea, coffee, and fluoridated water are all sources of it. It is essential for the development of dental polish, the mineralization of bones, and the prevention of dental cavities. By adding fluoride to water and adding fluoride to toothpaste, dental cavities can be avoided. Children can receive fluoride salts in the form of drops, pills, and mouthwash. The cause of dental fluorosis is toxicity[23].

1.3.8 Phosphorus

It can be found from legumes, nuts, cereals, fish, meat, cheese and poultry[24]. Because phytic acid is present, the bioavailability of minerals like iron and zinc may be poor in a completely vegetarian diet. Furthermore, excessive dietary fiber may prevent adequate absorption.

1.3.9 Potassium

It can be derived from beef, whole and skim milk, as well as from bananas, raisins, and prunes. For the heart to function normally, plasma potassium levels must be in the right range. Skeletal muscle fibers require potassium ions in order to operate properly. Many enzyme processes require potassium[25]. Glycogenesis requires the presence of potassium. Insulin administration causes a fall in plasma potassium level because the deposition of glycogen brought about by insulin is also accompanied by the deposition of potassium. Moreover, insulin also increases protein synthesis within the cells, which by binding potassium ions can lead to a low plasma potassium level. Potassium deficiency leads to hypokalemia, paralysis, and cardiac disturbances. Excessive potassium levels lead to hyperkalemia, paralysis and cardiac disturbances[26].

1.3.10 Sodium

The majority of foods include sodium, therefore dietary deficiencies are uncommon. Sodium plays a role in blood pressure regulation. The most prevalent type of sodium that is sold as table salt is sodium chloride[27]. Normally, 98% of the sodium lost by the body occurs in urine, which is regulated mostly by the kidneys. More sodium consumed results in more sodium being excreted in the urine. The amount of sodium in the blood may completely decrease if less sodium is consumed or if plasma sodium levels drop for any reason. Aldosterone, an adrenocortical hormone that stimulates salt tube reabsorption in the renal tubules, is typically responsible for this. Hypernatremia is characterized by seizures, edema, neuromuscular excitability, irritability, weakness, and lethargy and is caused by an increase in salt levels in the blood[28].

1.4 WATER AS AN ELECTROLYTE SOURCE:

Water is essential to the human body because it is involved in almost all of the chemical reactions that make the body work. The body needs a certain amount of water every day in order to function properly. Food and drink are the primary sources of water. Water is the most abundant and important

macronutrient in the body. It makes up about 60 percent of body weight. Water has many important roles in the body. It helps regulate body temperature, transports nutrients, makes up a significant portion of all cells, moisturizes the skin, lubricates joints, and aids in digestion, absorption, and excretion in addition to ensuring that people are adequately hydrated. The mechanism that alerts humans they need water is thirst. Dehydration, or a shortage of water in the body's cells and fluids, results from a lack of water in the body. On the other side, too much water can result in water intoxication, a condition that alters the amount of water in cells because the body has too much water but not enough electrolytes. Dehydration might appear as quick weight loss, but water intoxication may manifest as rapid weight gain. Both water intoxication and dehydration create serious health risks.

Requirements for Water The daily Adequate Intake (AI) for water is 3.7 liters for males and 2.7 liters for women, according to dietary surveys conducted in the United States. These totals include all sources of water, including drinking water, food, and beverages. The amount of physical activity and continuous exposure to high temperatures affect an individual's hydration requirements differently. Athletes need to drink more water during practice and competition because they need to cool down and replenish any fluids lost via perspiration. Most people drink enough water to quench their thirst.

1.5 CONCLUSION

The basic information obtained from relevant articles in order to broaden the aspect of knowledge as well as fundamental needs. The reader benefits from having a easiest summary of the report about vitamins and electrolytes thorough a compact theme, moreover, the current study emphasized the need of focusing suitable and oriented source of macronutrients and micronutrients. Electrolytes and vitamins are essential for the body's development and normal operation. Vitamins fall into two categories: fat-soluble vitamins and water-soluble vitamins. A, C, D, E, and K are examples of recognized vitamins, along with thiamin (B1), riboflavin (B2), niacin (B3), pantothenic acid (B5), pyridoxine (B6), cyanocobalamin (B12), biotin, and folate/folic acid. Calcium, phosphorus, potassium, sodium, chloride, magnesium, iron, zinc, iodine, sulfur, cobalt, copper, fluoride, manganese, and selenium are a few electrolytes that are crucial for good health. Macro minerals and trace elements are the two categories into which the body's vital minerals are separated. Although several research from recent years have suggested a general decline in Bangladesh's nutritional levels, experts are divided on the subject. Because of insufficient farming and soil minerals, there were not enough vitamin sources available in our country. Additionally, different types of electrolytes can be found in a variety of sources, but not all of these sources are consistently open to the general public. The importance of vitamins and minerals is not well known. Last but not least, eradicating vitamin and mineral deficiencies will necessitate an integrated strategy that coordinates necessary measures at every level, inside, and across the many sectors of society.

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