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IMPACT ON AGING AND AGE-ASSOCIATED DISEASES WITH SPECIAL REFERENCE TO FOOD AND NUTRITION

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Abstract
Senescence is characterized by various physiological changes, all of which have a contrasting effect on the health and lifestyle of the elderly. With advancing age, the significance of nutrition increases. It exerts a significant impact on the quality of life, encompassing both physical and mental well-being. The elderly population experiences a decline in food intake as a result of biological changes. This decrease in food intake can lead to nutritional deficiencies, which are the main cause of different chronic diseases and declining health associated with aging. Intervention can be employed to tackle the persistent condition of dietary insufficiency and malnutrition. This article provides an overview of the relationship between oral health and nutritional status in the elderly, with the aim of promoting a healthy lifestyle in this population.

Keywords: geriatric, nutrition, aging, nutritional analysis.

Introduction

Eating satisfaction is regarded as a crucial determinant of quality of life in the senior population. Currently, a significant number of individuals who are 65 years old or older have either some or all of their teeth missing, leading to a decrease in their ability to chew food effectively. Consequently, this leads to a change in their dietary preferences, which has a substantial effect on their well-being. Restoring masticatory function in elderly patients who are partially or fully toothless poses a challenging task for dentists. Nevertheless, there are various supplementary factors that are crucial for the nutritional quality of the elderly. Therefore, many health conditions associated with aging are influenced by dietary factors, and an individual's socioeconomic status and dietary habits have a significant impact on their food choices. An in-depth knowledge of nutritional needs, signs of malnutrition, and external variables that impact food choices will assist dentists in identifying denture users who are at risk of malnutrition and giving them with suitable nutritional guidance. Each patient's problems and oral health conditions vary; thus, recommendations need to be tailored to the specific needs of the person. This article examines the correlation between oral health and nutritional status in the elderly [1-6]

Nutritional Objectives

Create a well-rounded dietary plan that considers an individual's physical, social, mental, and economic circumstances. Establish an interim nutritional support plan with a specific goal, such as preventing tooth decay, promoting healing after surgery, or improving tissue health. Evaluate and establish factors within the community of individuals in the age group using prostheses that may facilitate or hinder nutritional intervention.

Age-Related Determinants Influencing Nutritional Requirement

Biological factors that influence or determine an individual's physical characteristics or functions. Geriatric individuals struggle to meet recommended dietary requirements due to a decline in their ability to consume sufficient amounts of food as they age. The decline in food consumption that occurs naturally with age is referred to as "anorexia." With the diminution of lean body mass in the elderly, their calorie requirements decrease and the risk of falling increases. The decrease in caloric consumption is associated with many factors that exacerbate the elderly anorexia syndrome.

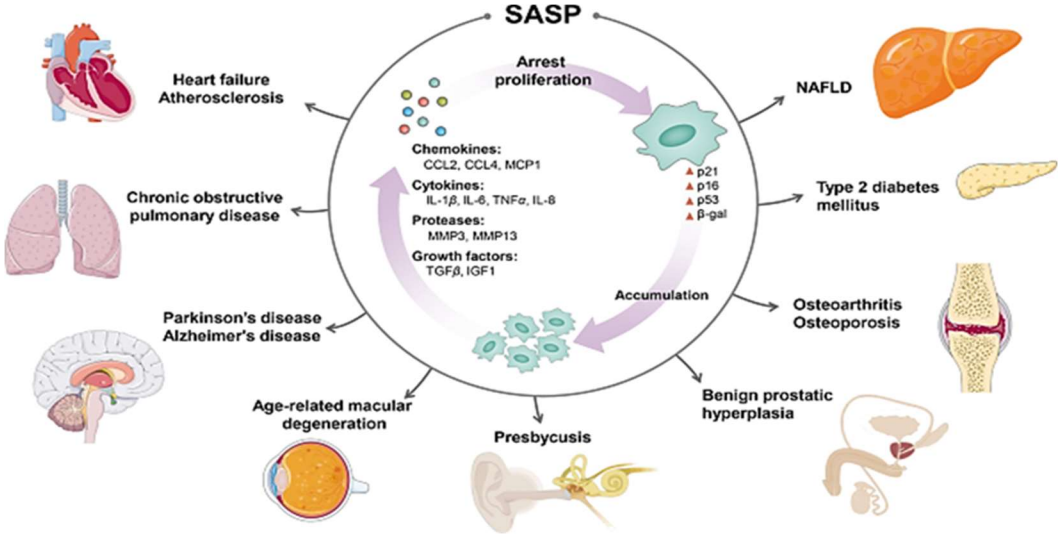

FIGURE 1: AGING AND AGING-RELATED DISEASES

The hormones that affect decreased food intake include leptin, glucagon-like peptide-1 (GLP-1), cholecystokinin (CCK), ghrelin (also known as the hunger hormone), insulin, and peptide YY (PYY). With advancing age, there is an increase in plasma concentration of CCK, leading to an earlier feeling of satiety and reduced food intake. GLP-1 and PYY stimulate the stomach to generate inhibitory signals, leading to a decrease in hunger. Decreased plasma ghrelin levels are associated with the process of aging, leading to delayed stomach emptying and reduced food consumption. An association has been observed between decreased insulin levels and increased circulating leptin levels in elderly individuals with anorexia. Proinflammatory cytokines, such as Interleukin (IL) 1, IL-6, and tumor necrosis factor α, have the effect of reducing the speed of stomach emptying and increasing leptin levels. This, in turn, leads to a decrease in food consumption. Chronic gastritis, stalled intestinal motility, diminished gastric secretions, and impaired gallbladder contraction all contribute to the slowing down of gastric emptying and a decrease in food consumption. Dehydration is a significant concern among older adults and a notable problem during the recovery period after surgery, primarily because of reduced kidney function and overall water balance. It is a critical issue that has to be addressed. In addition to chewing discomfort, individuals often experience xerostomia, poor taste sensations, oral paresthesia, and pain.

The immune system's function appears to be affected by the frequent occurrence of certain dietary deficiencies, such as zinc and vitamin B6, in nursing homes. The presence of insufficient levels of many vitamins, including B1, B2, B3, B5, B6, B9, B12, C, and E, is associated with a decrease in neurological and behavioral functions in older individuals [7-12].

Psychosocial determinants

Elderly individuals are especially susceptible to harm, and those who face a higher risk include those who are bereaved, socially isolated, experiencing depression, physically incapacitated without sufficient care, living alone, facing depression, following a restrictive diet, and having a low socio-economic position. Environmental changes are recognized to elevate stress levels, hence influencing food patterns and heightening the susceptibility to anorexia.

Functional determinants

Indirectly, nutritional status can be affected by conditions such as stroke, arthritis, hearing loss, or eyesight degradation.

Pharmacological Factors

A significant proportion of elderly individuals consume multiple prescription and non-prescription drugs on a daily basis. Geriatric people are more prone to experiencing adverse medication reactions due to age-related metabolic alterations and reduced drug elimination. The risk is exacerbated by the increased use of drugs. Prescription drugs are the primary cause of anorexia, nausea, vomiting, gastrointestinal issues, dry mouth, loss of taste, and disturbances in the absorption and use of nutrients. These diseases can lead to nutrient deficiencies, weight loss, and ultimately malnutrition.

Factors that influence or affect oral health.

Xerostomia refers to the medical condition of having an abnormally dry mouth. The aftereffect might be caused by many medications that have a harmful impact on the tissues that provide support to the dentures. It also exacerbates anorexia by causing difficulties in chewing and swallowing, which negatively impacts food selection and contributes to a state of inadequate nutrition. [13-19].

Gustation and olfaction

Anosmia or hyposmia can occur as a result of alterations in olfactory epithelium cells, whereas hypogeusia may be attributed to a decrease in the quantity and sensitivity of papillae, taste buds, or the density of taste buds on the tongue. Diminished sensory functioning affects food consumption in older adults, both in terms of quality and quantity. It has the ability to diminish the attractiveness of some foods (such as sensitivity to the bitterness of cruciferous vegetables), limiting their intake and their potential contribution to overall health.

Reduced function may be influenced by medications, medical disorders, dental hygiene, denture usage, and smoking.

Oral Infectious Conditions

The likelihood of developing periodontal disease rises with age, leading to nutritional deficiencies as a secondary consequence. Toothed Condition Insufficient dental health hinders the ability to chew properly, which in turn leads to poor food choices and changes in an individual's nutritional intake. Higher and more diverse nutrient intakes, as well as improved diet quality, were found to be associated with the presence of natural teeth and properly fitting dentures.

The consequences of ill-fitting dentures include limited ability to chew food, particularly for elderly individuals, resulting in inadequate nutrition. Compared to individuals with normal teeth, denture wearers have a significantly reduced ability to chew and digest food. Individuals who wear complete dentures typically need to make, on average, four to eight times more chewing strokes than those with natural teeth in order to achieve the same level of food pulverization. Denture wearers experience reduced chewing efficiency as a result of longer chewing and swallowing of larger food particles. This is primarily caused by a decrease in bite force due to insufficient denture retention and stability.

The impact of dentures on nutritional status varies significantly among individuals.

Geriatric individuals compensate for decreased chewing efficiency by opting for processed or cooked foods. They habitually masticate it for an extended duration before rendering it palatable enough to be ingested.

Some individuals may exclude entire food groups from their diets due to reduced ability to chew effectively. Although the chewing efficiency of individuals wearing complete dentures was found to be inadequate, approximately 80% of these individuals considered their self-assessed chewing efficiency to be satisfactory.

Nutritional considerations for the geriatric population

The geriatric diet lacks essential nutrients necessary for maintaining good health, resulting in nutrient deficiency and the advancement of degenerative diseases. The number is 36. As individuals age, their energy requirements drop due to a decrease in basal metabolism and physical

activity. However, the body's need for protein and certain nutrients increases in order to maintain proper functioning. The recommended dietary allowances vary between males and females, as presented in Table 1.

Energy units

Research has shown that the basal metabolic rate of elderly individuals decreases by 15 to 20% over their lifespan. The decrease is attributed to a reduction in lean body tissue, primarily associated with muscle atrophy. The number is 40. The residual energy expenditure consists of calories expended for labor and physical activity. The average age restricts their lifestyle and results in reduced physical activity, thereby leading to muscular atrophy. Muscle tissue atrophy is caused by a reduction in usage. Multiple studies have demonstrated that exercise can assist older adults in maintaining their weight and body composition. If there is still a problem with calorie balance, the older individual should simply decrease their consumption of dietary fat. Calories from fat are the most nutritionally dense, however they can be replaced with complex carbohydrates that have fewer calories and a higher nutrient content.

Geriatric obesity becomes a concern when the individual's body weight exceeds 20% of their optimal body weight. For individuals with hyperlipidemia, hypertension, heart disease, diabetes, gout, or arthritis, the initial course of action should be to maintain an optimal body weight.

Proteins

In the field of geriatrics, there is an elevated need for protein, specifically for certain important amino acids such as lysine, cystine, and methionine. Sarcopenia, a condition characterized by the loss of muscle mass, is commonly observed in the elderly population as a result of reduced protein intake [20-29].

Table 1 Recommended dietary allowances and adequate Intakes, elements food and nutrition board, national academies

Gender	Males (years)		Female (years)	
Age	51–75	76	51–75	76
Energy (Kcal)	2400	2050	1800	1600
Total water (L/d)	3.7	3.7	2.7	2.7
Nutrients	51–70 years	>70 years	51–70 years	>70 years
Carbohydrates (gm/d)	130	130	130	130
Proteins (gm/d)	56	56	46	46
Total fiber (gm/d)	30	30	21	21
Vitamins				
Vitamin A (µg/d)	900	900	700	700

Vitamin C (mg/d)	90	90	75	75
Vitamin D (µg/d)	15	20	15	20
Vitamin E (mg/d)	15	15	15	15
Vitamin K (µg/d)	120	120	90	90
Thiamin (mg/d)	1.2	1.2	1.1	1.1
Riboflavin (mg/d)	1.3	1.3	1.1	1.1
Niacin (mg/d)	16	16	14	14
Vitamin B6 (mg/d)	1.7	1.7	1.5	1.5
Folate (µg/d)	400	400	400	400
Vitamin B12 (µg)	2.4	2.4	2.4	2.4
Minerals	51–70 years	>70 years		
Calcium (mg/d)	1000	1200	1200	1200
Chromium (µg/d)	30	30	20	20
Copper (µg/d)	900	900	900	900
Iodine (µg/d)	150	150	150	150
Iron (mg/d)	08	08	08	08
Magnesium (mg/d)	420	420	320	320
Manganese (mg/d)	2.3	2.3	1.8	1.8
Molybdenum (µg/d)	45	45	45	45
Phosphorus (mg/d)	700	700	700	700
Zinc (mg/d)	11	11	08	08
Potassium (mg/d)	3,400	3,400	2,600	2,600
Sodium (mg/d)	1500	1500	1500	1500
Chloride (g/d)	2.0	1.8	2.0	1.8

Reduced protein levels can result in edema, as well as impact bone health, leading to functional decline and increased fragility. Geriatric individuals with acute or chronic diseases exhibit a diminished anabolic response to protein, resulting in a heightened demand for protein. Animal protein consumption is associated with superior preservation of muscle mass compared to other sources, mostly due to its higher concentration of necessary amino acids. Optimal sourcing and precise timing of protein and amino acid supplementation enhance protein absorption in the

elderly. Food sources encompass birds, meats, and fish that are prepared by boiling rather than being dehydrated, as well as dairy products. When ingested in sufficient quantities, nuts, grains, legumes, and vegetables are nutritionally equivalent to animal-based protein.

Carbohydrates

Geriatric people consume a significant amount of carbs as a major source of calories due to their low cost, capacity to be stored without refrigeration, and convenience of preparation. This may result in a reduced intake of protein.

Although carbs make up 45 to 50% of daily calorie intake, most recommendations advocate increasing complex carbohydrates to include 55 to 60% of total calories.

Augmenting the consumption of complex carbohydrates in one's diet also enhances the intake of essential nutrients, as starchy foods encompass vitamins and minerals as well. Replacing carbohydrate items with calorie-dense foods, such as those high in fat, reduces overall calorie consumption. Undoubtedly, consuming an excessive number of calories from any source can result in weight gain. However, it is important to note that certain clinical conditions are specifically triggered by the consumption of carbohydrates.

Glucose intolerance and lactose intolerance are two diseases associated with impaired carbohydrate metabolism in older adults. Lactose intolerance is an inherited condition characterized by impaired functionality of the enzyme lactase (P-galactosidase).

Lactase deficiency inhibits the enzymatic breakdown of lactose (a disaccharide) into galactose and glucose. Disaccharides are not capable of being absorbed by the body. As a result, they pass from the small intestine to the colon, where they are metabolized by intestinal bacteria. This process leads to the production of metabolic by-products such as CO2 and lactic acid. These by-products disrupt the osmotic equilibrium in the intestines, causing water to enter rapidly. This, in turn, leads to the occurrence of diarrhea. While the severity of lactose intolerance may differ, most people will not experience symptoms if they consume a low amount of lactose. Typically, elderly people who are affected tend to immediately avoid consuming milk, which is not recommended because milk is a valuable source of protein, calcium, riboflavin, and other essential elements. Instead of completely avoiding dairy products, it is advisable to take them in moderate amounts. It is recommended to consume smaller quantities of dairy or opt for lactase-treated milk and fermented milk products.

Another concern is the heightened occurrence of glucose intolerance in the elderly population, which is also associated with the development of adult-onset diabetes. This condition arises from elevated blood glucose levels and reduced ability to tolerate carbohydrates. In order to achieve caloric equilibrium, it is advised to augment the consumption of complex carbs while diminishing the intake of fats.

Fiber in food

An undigested food component that successfully reaches the colon in a healthy human gut. The physical characteristics of fiber, such as water holding capacity, viscosity, binding, and fermentability, might impact the process of digestion and absorption. Polysaccharides can modify the process of food digestion and nutrient absorption due to the fact that the small intestine is

unable to break down fiber. Its metabolic significance lies in its influence on lipid and glucose metabolism. Fibers lower overall serum cholesterol and triglyceride levels by generating short chain fatty acids, which aid in lipid metabolism. Fiber can potentially influence glucose or insulin levels in glucose metabolism, resulting in a decrease in lipogenic enzymes. This activity can be particularly advantageous for individuals with diabetes since it reduces fasting blood glucose and glycosylated hemoglobin levels, and it also has the potential to lower the risk of coronary heart disease.

Non-digestible dietary substances, such as prebiotics, exert a beneficial impact on the host by promoting selective proliferation and/or function of a specific bacterium or a limited group of bacteria.

The presence of an unhealthy balance of bacteria in the colon and their metabolic activities can lead to the production of harmful substances that worsen long-term inflammation or promote the production of mutagenic compounds, both of which increase the risk of colon cancer. Fibers have a connection to bowel disease and its symptoms. Specifically, butyrate can aid in maintaining remission of inflammatory bowel disease by promoting the growth of mucosal cells and expediting the healing process. Administer glutamine to colonocytes in order to enhance the strength of the mucosal barrier, hence decreasing the movement of germs across the colonic epithelium and the resulting damage to the mucosa. The edentulous older population frequently experiences gastrointestinal issues due to reduced intake of fiber-rich foods caused by diminished chewing efficiency. Food sources comprise whole grain bread, brown rice, whole fruits, legumes, cooked vegetables, fresh salad, and, notably, high-fiber cereal for breakfast [30-36].

Water

Water intake counterbalances inherent physiological fluid losses, enhances digestive and intestinal functions, and aids in the elimination of waste products through the kidneys. The elderly individual must be encouraged to increase their water intake due to the following reasons. Adults can experience negative water balance due to either excessive water loss caused by impaired renal function or fluid retention in an effort to decrease urine frequency or control incontinence. Dehydration in older adults can cause symptoms such as nausea, constipation, low blood pressure, elevated body temperature, dryness of the mucous membranes, reduced urine production, and mental confusion. Moreover, the consumption of alcohol, together with various therapeutic medications like diuretics, might expedite the depletion of fluids in the body.

Geriatric individuals are particularly susceptible to extreme heat due to diminished perception of temperature changes and limited mobility. This vulnerability can result in dehydration and elevated body temperature. Conditions such as diabetes, obesity, congestive heart failure, and obstructive lung disease further increase the risk of heat stroke in the geriatric population. Consequently, it is crucial to regularly monitor fluid equilibrium.

Vitamin A

There are two types of vitamin A that can be obtained from food. The first type is β-carotene, which is a precursor to vitamin A and is found in bright green and yellow fruits and vegetables such as apricots, carrots, and spinach. The second type is retinol, which is the active form of

vitamin A and is found in animal-based foods. Vitamin A deficiency leads to neurodegeneration, disruption of steroid and thyroid hormone physiological function, as well as anomalies in eyesight and skin. In the context of neurodegeneration, all-trans rheumatoid arthritis exhibits a protective effect. In the progression of Alzheimer's disease, it decreases the production of amyloid-β peptides and their formation into oligomers. Oral alterations encompass diminished saliva production, drying and hardening of the oral mucosa, and decreased ability to perceive flavor. Prolonged deficiency can lead to gum hypertrophy, as well as widespread gingivitis.

Vitamin B Complex

The vitamin B complex comprises eight water-soluble vitamins that play interconnected functions in the maintenance of cellular function and prevention of brain atrophy. A lack of folate, B6, and B12 is associated with increased levels of homocysteine in the blood, which in turn raises the risk of certain conditions such as dementia and Alzheimer's disease. The frequent utilization of laxatives for constipation treatment in the elderly population modifies intestinal metabolism and disrupts the absorption of vitamin B complex.

The principal source of nutrition is animal foods. Therefore, a deficiency in animal foods is more common when there is a decrease in their intake, either owing to cultural or religious restrictions or excessive cost.

Thiamine, also known as Vitamin B1

Thiamine pyrophosphate serves as a cofactor for transketolase, pyruvate dehydrogenase, and α-ketoglutarate dehydrogenase. Additionally, it plays an unidentified role in the transmission of nerve impulses and the maintenance of the myelin sheath. The deficiency of this nutrient can affect the neurological, immunological, and cardiovascular systems, as observed in dry beriberi, Wernicke-Korsakoff syndrome, or wet beriberi. Commonly observed among individuals who are impoverished, institutionalized, and have alcohol dependency, particularly in regions where the main dietary staples consist of processed cereals and refined rice. Food sources encompass a variety of options such as cereals, pasta, whole grains, fortified breads, dried beans, peas, soybeans, lean meats, and fish. Fruits, vegetables, and milk products are most effective when ingested in substantial amounts.

Pyridoxine, also known as Vitamin B6

Presented is a correlation between cardiovascular risk and lipids. Involved in diverse metabolic pathways related to CNS function, including amino acid metabolism and neurotransmitter production and the processes of sphingolipid production and degradation. Geriatric individuals have increased requirements due to decreased absorption, elevated catabolism, and impaired phosphorylation. It can significantly contribute to the increased prevalence of carpal tunnel syndrome in the elderly population.

Deficiency results in nasolabial seborrhea, glossitis, and affects cognitive performance, sometimes accompanied by depressive symptoms common in the elderly. It inhibits the metabolism of serotonin and acts as an antagonist of the P2X receptor. Both are associated with the gastrointestinal function; therefore, they may indicate a connection between the intake of vitamin

B6 and symptoms in individuals with irritable bowel syndrome. Food sources encompass a variety of options such as meat, fish, poultry, fortified cereals, legumes, and select fruits and vegetables.

Vitamin B12, also known as Cobalamin

The deficiency of this condition is present in 5 to 20% of elderly individuals, but often remains undetected due to its modest clinical signs. The causes of the deficiency include malabsorption resulting from degenerative digestive disorders or insufficient production of intrinsic factor, pernicious anemia, and low food intake. Endorsing dietary fiber therapy for the treatment of constipation reduces the need for laxatives and enhances the absorption of vitamin B12. Fortified foods can serve as a substitute for vitamin B12 for vegetarians, as they primarily derive their vitamin B12 from animal sources.

A deficiency of this nutrient can lead to megaloblastic anemia and demyelinating neurological symptoms, including irreversible nerve damage and neuropathy. It impacts cognitive functioning and is frequently accompanied by depressive symptoms that are common among older adults. Furthermore, it demonstrated its correlation with elevated risk of cardiovascular disease and impact on bone health. Oral manifestations include glossodynia, glossitis, dysgeusia, recurrent ulcers, cheilitis, lingual paresthesia, pruritus, and burning sensations. Food sources encompass many animal-derived meals, such as meat, fish, eggs, as well as milk products. Additionally, fortified breakfast cereals and nutritional yeasts are also considered as sources of nutrition.

Folate, also known as Vitamin B9

The process of methylation of homocysteine is associated with the prevention of age-related chronic diseases, and folate and vitamin B12 play a crucial role in this process. This phase is crucial in preventing the buildup of tau and amyloid proteins, which might potentially result in cognitive decline. Furthermore, there is evidence linking an elevated risk of cardiovascular problems and compromised bone health to insufficient levels of Vitamin B2 (Riboflavin) when investigated in conjunction with B12. Insufficient levels of folate have also been associated with colon cancer. Because of its diverse food sources, its deficiency is uncommon. Food sources encompass a variety of options such as eggs, lean meats, green leafy vegetables, legumes, nuts, milk products, and fortified breads and cereals. Food sources encompass liver, dark-green leafy vegetables such as turnip greens and lettuce, broccoli, citrus fruits, whole grain products, wheat germ, and dried beans and peas.

Ascorbic acid

The lack of geriatric care has been associated with a significant decline in physical ability, characterized by reduced muscle mass, weak grip strength, and slow walking speed. Scientific research has established a connection between antioxidants such as vitamin A, C, E and the development of cancer, heart disease, stroke, and arteriosclerosis. Oral manifestations include bleeding gums, petechial, poor tissue healing, and aching joints. Food sources encompass citrus fruits, tomatoes, potatoes, and green vegetables [37-40].

Vitamin D

With advancing age, individuals experience a significant decline in both the intake and absorption of vitamin D. This decline can be attributed to less exposure to sunlight, decreased dietary

consumption, diminished fat absorption, and a decrease in the conversion of vitamin D into its active form. The deficiency of vitamin D affects the balance of calcium in the body by decreasing the absorption of calcium in the intestines. Additionally, it is associated with depression, cancer, cognitive decline, and cardiovascular disease in older individuals. Vitamin D and calcium also have an influence on lipid metabolism, neuromodulation, and the blood vessels.

Vitamin D improves the ability of macrophages to remove waste and foreign substances through phagocytosis. It also safeguards immune cells from programmed cell death by regulating protein activities outside the cell nucleus and controlling gene expression signals. Postmenopausal women face an elevated risk of calcium deficiency due to reduced absorption of calcium, accelerated bone loss caused by estrogens, and increased excretion of calcium in urine. The deficiency of Vitamin D3 is worsened by the kidney's inability to convert 25(OH) vitamin D3 to 1,25 (OH) vitamin D, as well as the decreased capacity of the intestine to absorb vitamin D3. values of serum 25(OH)D below 50 nmol/L are associated with decreased muscle strength and physical function in older adults, while values below 25 to 30 nmol/L elevate the likelihood of experiencing falls and fractures. Food supplies comprise of enriched milk, fish-liver oil, and marine fish. Cholecalciferol is naturally present in animal feeds as a provitamin.

Vitamin E

There are eight distinct natural forms of this substance, which are tocotrienols (α, β, gamma, and delta) and tocopherols (α, β, gamma, and delta). All of these forms possess potent antioxidant properties. While γ-tocopherol is commonly found in the human diet, most research have focused on α-tocopherol, which is more biologically active and can be found in many over-the-counter supplements. Deficiency is rare and primarily occurs in disorders that result in impaired absorption of fat, such as chronic cholestatic liver disease, abetalipoproteinemia, cystic fibrosis, and short bowel syndrome.

Vitamin K

Vitamin K is a versatile vitamin that is associated with age-related diseases such as vascular calcification, osteoarthritis, and osteoporosis. It has been demonstrated that this substance functions as an anti-inflammatory agent by inhibiting the signal transduction of nuclear factor κB and providing a protective effect against oxidative stress by blocking the production of reactive oxygen species. Food sources encompass green leafy vegetables such as soybean and canola oil.

Minerals

Calcium

Vitamin D has a crucial role in various physiological processes such as vasodilation, vascular and muscular contraction, intracellular signaling, nerve transmission, and hormone production. Additionally, it is closely connected to calcium, and together they influence lipid metabolism, vasculature, and neuromodulation. The process of aging is characterized by a range of declines, with the most common being a decrease in bone mineral density. This can result in serious fractures caused by osteoporosis and hinder the mobility of older individuals.

Postmenopausal women have an increased susceptibility to calcium deficiency due to a decrease in estrogen levels. This leads to a reduction in the absorption of calcium in the intestines and its

reabsorption by the kidneys. Additionally, there is a decrease in the amount of calcium absorbed and an increase in the secretion of parathyroid hormone, which results in the breakdown of bone tissue. Antinutrients such as tannins, oxalates, and phytates are known to form insoluble calcium complexes, leading to reduced calcium absorption in the intestine. A diet that contains a high amount of salt is linked to increased excretion of calcium in urine, leading to reduced calcium retention. In order to enhance calcium absorption, it is necessary to acidify calcium prior to digestion in geriatric individuals, as their decreasing stomach HCl levels lead to decreased calcium absorption. Food sources encompass dairy and its derivatives, commercially fortified foods, legumes such as peas and dried beans, verdant leafy vegetables, tofu, and canned salmon. Often, individuals who wear complete dentures experience rapid and uncontrolled loss of the bony ridge that supports the dentures. This can be attributed to a negative calcium balance, which can contribute to the development of osteoporosis.

Iron

An essential functional component involved in several metabolic processes, including the transfer of oxygen, inactivation of dangerous oxygen radicals, creation of oxidative energy, and synthesis of DNA. It serves as a cofactor in the central nervous system for oxidative phosphorylation, neurotransmitter synthesis, oxygen transportation, and nitric oxide metabolism. It is crucial for neuroprotection and neuronal functions. The immunological and antioxidant functions are crucial for maintaining health in older adults. It hinders in situations characterized by long-term inflammation, such as obesity or age, since inflammation affects hepcidin, which regulates the balance of iron in the body. It exacerbates malnutrition even more. Postmenopausal women and older men are more susceptible to iron deficiency due to chronic blood loss caused by illness conditions, lower iron absorption resulting from decreased acid production, the use of drugs such as antacids, or a low intake of dietary iron and reduced food consumption.

The aging process disrupts the body's ability to maintain a balance between iron reserves and supply, which exacerbates the condition of anemia. Iron deficiency anemia is linked to reduced cognitive function, decreased physical strength, symptoms of sadness, lower quality of life, and higher rates of hospitalization and mortality in older adults. Tannins, phytate, polyphenols, and calcium have a negative effect on iron absorption, but iron absorption is enhanced by vitamin C. Orally, a deficiency of it results in a condition known as burning tongue, as well as anemia and angular cheilosis.

An iron deficiency can be corrected by consuming food that is rich in iron and by taking iron supplements. If oral treatment is not effective, consider using intravenous iron supplementation. Conditions characterized by excessive iron accumulation, particularly hemochromatosis, result in an excessive amount of iron in the liver. This leads to cellular damage, cirrhosis, fibrosis, and an increased risk of hepatocellular cancer and infection. Iron chelation therapy might be considered as a treatment option. Food sources encompass a variety of options such as green leafy vegetables, whole grains, meat, fish, poultry, fortified breads and cereals, as well as peas and dried beans.

Zinc

Involved in the intricate processes of DNA synthesis, transcription, signal transduction for immune cell function, enzymatic catabolism, and metabolism of several micronutrients. Insufficient levels result in a compromised immune system and decreased T cell-mediated activities, which heightens the risk of infections. The deficit also affects the functioning of different nutrients. For instance, the synthesis of retinol-binding protein is dependent on zinc. This is important for the transportation of vitamin A to the plasma and the liver's retinol. Insufficient levels of zinc in the blood increase the need for vitamin E due to a decrease in the absorption of vitamin E in the intestines and a decrease in the absorption of dietary folate. The deficit is a significant factor contributing to ageusia, which strongly affects the dietary choices of the elderly.

Inadequate dietary zinc intake, combined with intrinsic and extrinsic variables, primarily leads to a zinc imbalance in the intestine and other tissues, mostly caused by a reduction in metallothionein synthesis. Changes in the form of the small intestine's finger-like projections, differences in the structure of the energy-producing organelles within cells, elongation of the small intestine's crypts, modifications in the collagen content, and an increased rate of replication of cells within the crypts significantly affect the absorption of zinc in older individuals. Additional causes encompass inadequate mastication of food, dental issues that impede food ingestion, diverse drugs that modify absorption, and psychosocial elements that constrain dietary intake. Food sources encompass legumes, enriched cereals, nuts, seafood, poultry, red meat, whole grains, and dairy products.

Chromium

The dinicotinic acid glutathione complex is an essential component that enhances the action of insulin. Potential involvement in lipid metabolism. In an in vitro investigation, it has been discovered that it forms a bond with DNA, leading to aberrant RNA synthesis. There is a suggestion that a lack of chromium may lead to poor glucose tolerance and ischemic heart disease. The risk of inadequate chromium intake is higher in elderly individuals due to factors such as chewing insufficiency, anorexia, lack of willingness to cook, and consumption of a diet low in refined chromium. Food sources encompass a variety of options such as meats, grains, spices, vegetables, fruits, and nuts.

Copper

Age has a minor impact on another crucial mineral. Insufficient levels of a certain substance can heighten the likelihood of fractures by diminishing the durability of bones. Both copper and iron are indispensable and harmful metals. With the exception of hereditary overload disorders such as Wilson's disease and hemochromatosis, the toxicity of these substances is not as well comprehended as their essentiality. Both metals are transition elements, and the advancement of oxidative energy production has utilized the redox capabilities that arise from this. Nevertheless, these factors result in excessive generation of deleterious oxidizing radicals. An excessive amount of iron and copper can lead to the development of aging disorders such as Alzheimer's and other neurodegenerative diseases, diabetes mellitus, and arteriosclerosis. An imbalanced ratio of zinc to copper in the diet can contribute to the advancement of coronary heart disease. Food sources

encompass a variety of options such as dark leafy greens, oysters, shellfish, whole grains, beans, nuts, potatoes, dried fruits like cocoa, black pepper, and yeast.

Iodine

One of the essential micronutrients crucial for human development and well-being. Plays a crucial part in the production of thyroid hormones. While the detrimental health effects of iodine deficiency are most noticeable in the fetus and throughout infancy, adverse results can be found at all stages of life. Thyroid dysfunction in adults is associated with dyslipidemia, hypertension, osteoporosis, cognitive impairment, muscle wasting, and weakness. Geriatric individuals are more susceptible to both iodine deficiency and excess due to age-related alterations in thyroid function, as well as conditions such as hyperthyroidism, hypothyroidism, and autoimmune thyroid disorders. Autoimmune thyroid illness. The availability of food may vary depending on the mineral composition of the soil in which the crops are cultivated.

Magnesium

Plays a vital part in the creation of energy, oxidative phosphorylation, glycolysis, protein synthesis, and nucleic acid synthesis. Engage in the process of ATP production to produce MgATP within the mitochondria. Magnesium ions participate in the transportation of other ions across cell membranes, the contraction of muscles, and the regulation of neuron excitability. The regulation of cellular magnesium levels is interconnected with the cellular metabolism of other ions, such as potassium (K), sodium (Na), and calcium (Ca), through mechanisms such as the Na+/K+ ATPase, calcium-activated potassium channels, and other processes. Maintaining an optimal balance of magnesium throughout one's life can help prevent the occurrence of oxidative stress and age-related chronic illnesses.

An imbalanced magnesium level can result from an elevated intake of calcium, sodium, protein, caffeine/alcohol, and certain medications such as diuretics. The main reason of the deficit is primarily due to inadequate food intake, decreased absorption, or increased urine excretion. It can also be secondary to age-related disorders and drugs. The clinical manifestations of hypomagnesemia are typically either absent or nonspecific, such as headache, anxiety, sleeplessness, exhaustion, hyperemotionality, depressive symptoms, and dizziness in cases of significant deficiency. However, individuals with mild hypomagnesemia normally do not exhibit any symptoms. Severe deficiency manifests as tremor, muscle fasciculation, weakness, difficulty swallowing, positive-Trousseau's sign, orthostatic hypotension, and/or borderline hypertension. Hypertension, cardiovascular diseases, stroke, cardio-metabolic syndrome, type 2 diabetes mellitus, airway constrictive syndromes, asthma, depression, stress-related conditions, psychiatric disorders, Alzheimer's disease, other dementia syndromes, bone fragility, muscular diseases, and cancer are all associated with a lack of it. Food supplies encompass legumes, verdant leafy greens, intact grains, seeds, and nuts.

Manganese

A trace element that is necessary for optimal biological functioning and acts as a cofactor for several enzymes. The scarcity of its deficiency is quite uncommon because of its availability in dietary food. Excessive consumption of manganese can lead to emotional and psychological

disturbances as well as motor symptoms resembling those of Parkinson's disease, such as tremors, difficulty walking, slow movement, and stiffness. Food sources encompass legumes, cereals, verdant leafy vegetables, tea, rice, and fruits.

Phosphorus

Essential for the existence of living organisms, as it plays a crucial role in the formation of cellular membranes as a constituent of phospholipids, ATP, and nucleic acids. Additionally, it plays a crucial role in cellular signaling through phosphorylation processes. The balance is affected by the interactions among the intestine, parathyroid glands, bone, and kidney. It is necessary in an ample amount for the deposition of calcium in the bone matrix and can initiate the process of bone healing. Instances of this dietary insufficiency are rare. However, in the event that it occurs, hypophosphatemia can result in cardiomyopathy, pseudomyopathy, and osteomalacia. Decreased levels of phosphorus inside cells can affect important processes such as neurological function, electrolyte balance, and muscular contraction by reducing the availability of ATP.

The risk of decreased phosphorus absorption in geriatric individuals increases when high levels of antacids (specifically aluminum hydroxide) are taken for the treatment of peptic ulcers. The elevated levels of this substance have been found to be associated with smoking, hypertension, albuminuria, poor estimated glomerular filtration rate (eGFR), and metabolic diseases. Food sources encompass a variety of options such as dairy products, meats and poultry, fish, eggs, vegetables, grains, and nuts.

Potassium

Sodium is the primary intracellular cation that plays a crucial role in regulating the membrane potential and electrical stimulation of nerve and muscle cells, as well as in acid-base regulation. Nutritional deficiency is rare due to the abundant presence of nutrients in a variety of diets. Additionally, the majority of potassium, which is filtered by the renal glomerulus, is reabsorbed along the kidney tubules. Due to age-related decline in kidney function and disruptions in the body's potassium balance, elderly individuals are more likely to develop hyperkalemia. This can be caused by reduced glomerular filtration rate (GFR), impaired renal tubular function, and changes in the renin angiotensin-aldosterone system. Additionally, certain medications such as β-adrenergic blockers, nonsteroidal anti-inflammatory drugs, and angiotensin-converting enzyme inhibitors can contribute to this condition. The risk is sometimes heightened by the existence of chronic hypertension, urinary blockage, or diabetes. Proper administration in the elderly population can help avoid potentially fatal neuromuscular and cardiac problems. Food sources encompass a variety of options such as verdant and starchy vegetables, fruits, legumes, nuts, and dairy products.

Sodium

Essentially indulged in the normal cellular equilibrium maintenance and blood pressure, fluid, and electrolyte balance regulation. Plays imperative role in maintaining extracellular fluid volume due to its essential osmotic action and is essential for the muscle and nerve cells excitability and for transit of nutrients and substrates through plasma membranes. Reduced serum sodium is a rather frequent electrolyte disorder in the geriatric due to the presence of determinants contributory

to increased antidiuretic hormone, the recurring medications associated with hyponatremia and also because of other mechanisms such as the "tea and toast" syndrome. Acute hyponatremia symptoms (<48 hour) include nausea, vomiting, headache, stupor, coma and seizures, as well as manifestations (even mild) associated with chronic hyponatremia, such as fatigue, cognitive impairment, gait deficits, falls, osteoporosis, and fractures. Food sources include cereals and cereal products, meat, eggs, fish, and milk products.

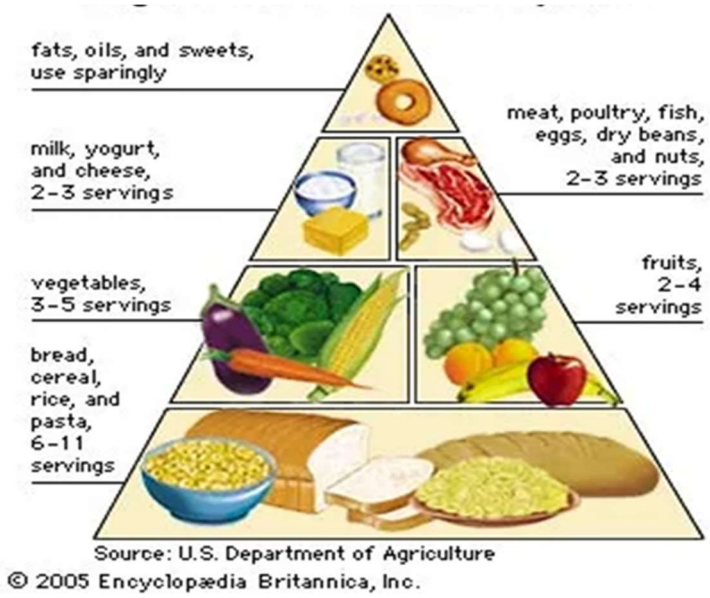

Fig. 2 (A) Initial food guide pyramid;

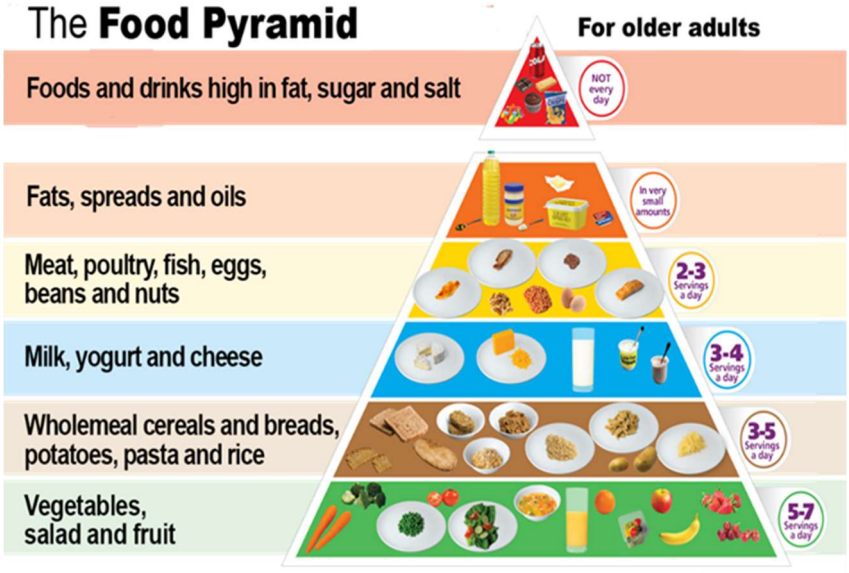

Figure 2(B) Revised food guide pyramid for people aged 70 and older.

Revised Food Guide Pyramid Illustration

The modified dietary pyramid has been specifically tailored for individuals aged 70 and above, considering the distinct nutritional needs of geriatric individuals (Fig. 2 a and b). The

revised Food Guide Pyramid for older adults emphasizes nutrient-rich foods, fiber, and water, while reducing the baseline to reflect lower energy requirements. Moreover, numerous elderly individuals may derive advantages from preparations specifically formulated with essential nutrients.

Evaluation of Nutritional Condition

Triphasic Nutritional Analysis is a method used to evaluate and analyze an individual's nutritional status. Phase I involves conducting screenings, collecting sociomedical history data, evaluating clinical indicators of nutritional deficiency, measuring anthropometric parameters, and analyzing the adequacy of individual diets in meeting their needs.

Qualitative nutritional assessment examines an individual's current and historical eating habits, including any recent modifications to their diet. This questionnaire may be administered by healthcare professionals in both inpatient and outpatient healthcare settings. The overall score can be used to predict the potential nutritional status. Subsequently, a nutritional assessment should proceed to Phase II. A nutritional evaluation must be performed, and appropriate dietary guidance should be implemented if sufficient information is obtained during Phase I to establish a logical foundation for treatment.

Phase II involves collecting supplementary data if the identified score suggests a possible nutritional issue, as indicated by the questionnaire. In addition, it is necessary to do semiquantitative nutritional assessment and routine blood testing.

Semiquantitative Dietary Analysis

During this phase of assessment, nutritional intake is evaluated using more precise quantitative methods. The nutrient composition of all foods and drinks ingested throughout a span of 3 to 5 days is measured using food composition tables or computer-assisted nutritional analysis methods. It is necessary to compare and quantify the average intake of calories and nutrients with established standards. The assistance of a certified dietician serving as a counselor is essential at this stage.

Biological evaluation

Regular blood tests are also important as they provide more conclusive information regarding a patient's nutritional health. However, most indices are often influenced by age-related decreases in kidney function and body water. This reduction is worsened by the effects of drugs and sustained severe circumstances. These indices are within the typical range for younger individuals.

This Phase III is intended for more intricate dietary issues and should be conducted under the supervision of a physician. At this step, a comprehensive evaluation of the nutritional biochemical status of tissues, blood, and urine is conducted, along with tests of metabolic and endocrine function. Recommended Foods for the Elderly

To achieve optimal health, it is necessary to consume an adequate quantity of various foods from the five food groups listed below. This will ensure that you obtain all the necessary nutrients in the appropriate proportions.

There are four servings of fruits and vegetables, which are classified into three categories: Two servings of vitamin C-rich foods, such as raw cabbage, salad greens, and citrus fruits. A single serving of a diet abundant in vitamin A, such as yellow and dark green fruits and vegetables. A

single serving of a combination of fruits, vegetables, and potatoes. Four servings of food products prepared with enhanced flour, cereal, and bread. Two servings of dairy, such as cheese, are recommended. It may be advisable to consume two servings of a high protein diet, such as non-vegetarian foods like meat, fish, poultry, and eggs. Notable sources encompass legumes such as dry beans, peas, and nuts. Other unspecified products, such as alcohol, fats, sweets, and oils, are also included. The recommended portion for polyunsaturated fats, which provide essential fatty acids, is 2 to 4 tablespoons.

Recommended Diet for Individuals Wearing New Dentures

The conventional process of mastication and deglutition becomes marginally more demanding for an elderly individual donning newly fitted full dentures. They might adopt a reversed eating schedule as it would be more convenient for them. Consequently, it is recommended that the elderly individual consume a diet consisting of liquids in the days after the acquisition of new dentures. It is recommended to adhere to a bland diet for the next several days, followed by a return to a regular diet by the end of the week.

Initial day following implantation Category: Fruit-vegetable group; Item: Juices The bread-cereal group includes gruels that are made by mixing milk or water.

Dairy category: any variant of fluid milk is permissible. It is imperative to have a serving of milk on the sample menu on a daily basis. Meat group: eggs in eggnogs, pureed meats, meat broths, or soups. Day two and day three after implantation Fruit-vegetable category: fruit juices; fruits and vegetables cooked until soft. The bread-cereal group includes rice, noodles, macaroni, soft baked breads, and cooked cereals. Dairy products: cottage cheese and liquid milk. It is recommended to consume a daily serving of milk, accompanied by either butter or margarine. Meat options: ground beef, hearty soup, tender chicken or fish in creamy sauce, scrambled eggs, etc. Day four and subsequent days More solid foods can be consumed alongside the soft foods after the fourth day or once the tender areas have fully recovered. Prior to consumption, it is optimal to slice them into little fragments. The sample menu should contain a serving of milk along with either butter or margarine.3 Nutrition counseling and dietary guidance for elderly individuals. The geriatric individual is unable to obtain the necessary nutrients from their diet due to inadequate food consumption. In response to this requirement, there has been a significant demand for dietary supplements such as multi-vitamins, protein, and minerals. Nevertheless, it is important to properly monitor the usage of supplements as the combination of fortified meals and supplements might elevate the risk of exceeding the permitted upper limit and causing toxicity.

As denture production necessitates multiple appointments, it is convenient to include food analysis and counseling as part of the treatment plan.

If a patient has a major deficiency, they should promptly seek medical attention for comprehensive diagnostic and therapeutic procedures. The dentist can provide essential guidance in cases of excessive consumption of cariogenic or unbalanced diets, which can lead to problems, or when there are moderate clinical indications along with inappropriate dietary practices [40-44].

Conclusion

The failure of complete dentures often arises from the patient's nutritional deficiencies. Nutritional deficiencies can be caused by factors such as insufficient calorie intake, impaired chewing ability, the presence of a medical condition, socioeconomic status, and psychiatric disorders. Adopting appropriate dietary patterns, utilizing supplements, and ensuring sufficient intake of essential nutrients are all viable approaches to maintain optimal health. Additionally, these measures can be employed to address severe deficiencies or to refer the patient for further medical attention, serving as preventive and therapeutic choices. A patient wearing dentures is unlikely to make significant changes to their diet, but if the importance is properly emphasized, they may incorporate nutritionally essential foods. Appropriate dietary modifications possess the capacity to enhance the well-being of the elderly population. Consequently, it is important to allocate extra focus towards senior health in order to uphold it and diminish the occurrence of chronic disorders.

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